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DOCUMENT HISTORY OF AGENA

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CHIEF OF STAFF
SPACE AND MISSILE SYSTEMS ORGANIZATION
AIR FORCE SYSTEMS COMMAND

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Prepared by

S. A. Grassly

November 1971

HISTORY OFFICE

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SPACE AND MISSILE SYSTEM ORGANIZATION (AFSC)

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216. SSD (SSHKK) Ltr to multiple address, subj: Authorization for type of Contract; Contract AF 04(695)-198, 7 Sep 62, w/1 atch.

217. SSD (SSHR) Ltr to SSZ, subj: Agena D FY-63 Funding Requirements to Support SSZ Program Requirements, 11 Sep 62.

218. SSD (SSH) Ltr to SSVR, subj: Agena D FY-63 Funding Requirements to Support NASA Program Requirements, 11 Sep 62.

219. Msg from SSD to CSAF, Cite SSH-13-9-10, 13 Sep 62.

220. Msg from SSD to AFSC, Cite SSH-13-9-11, 13 Sep 62.

221. SSD (SSHAA) MFR to Capt George W. Watts, 17 Sep 62.

222. SSD (SSH) Ltr to Lockheed, subj: Production of Optional Kits under the -68 Contract, 24 Sep 62.

223. SSD (SSG) Ltr to Secy of the Air Force (SAFFM), subj: FY-62 and FY-63 Agena D Funding Requirements, 27 Sep 62 (S/Gp3).

224. SSD (SSH) Ltr to Lockheed, subj: First Article Configuration Inspection of S-01A/13, 17-19 Sep 62, 28 Sep 62.

225. Msg Cite SSH 28-9-33, 28 Sep 62.

226. Lockheed ltr to AFSSD (DCCA), subj: Management of the S-01A Program, 1 Oct 62, w/1 Atch: Program Management Paper.

227. 1st Ind (Uncl w/o C/Gp4 Atch), SSD to SSVSP, subj:Liquid Rocket Engine Data, 5 Oct 62, w/1 Atch: Engine Data Chart.

228. SSD (SSHGD) Ltr to Lockheed, subj: Ground Rules for Management of the AC-1 System, 8 Oct 62.

229. Msg, Cite SSH 12-10-23, 12 Oct 62.

230. SSD (SSH) Ltr to SSG, subj: Agena Presentation, 15 Oct 62.

231. Msg (C/Gp4), Cite SSH 15-10-28, 15 Oct 62.

232. 1st Ind, SSD (SSH) to SSVZR, subj: Agena D/Gemini Configuration," 16 Oct 62.

233. Memorandum to SSH (Col Fletcher), subj: S-01A Requirements Based on TAT Boosted Missions, 18 Oct 62.

234. SSD (SSH) Ltr to AFPRO (Col Voyles), Lockheed, subj: AFPR Logistics Surveillance of Program S-01A, 19 Oct 62.

235. SSD (SSHR) Ltr to SSVZR (MajAlbert), subj: Optional Equipment Requirements for S-01A Vehicles, 22 Oct 62.

236. SSD (SSH) Ltr to SSHKK, subj: Sole Source Justification, Contract AF 04(695)-221, 22 Oct 62.

237. Msg, Cite SSH 23-10-37, 23 Oct 62.

238. SSD (SSHR) Ltr to SSO (Col Hedrick), subj: Agena D C&C Optional Equipment, 31 Oct 62.

239. SSD (SSHR) Ltr to SSVR, subj: Agena D FY-63 Funding Requirements to Support NASA, 1 Nov 62.

240. SSD (SSH) Ltr to Lockheed, subj: S-01A Vehicle Assignment Philosophy, 2 Nov 62.

241. SSD (SSH) Ltr to Lockheed, subj: Fixed Ullage Rocket Carrier Problem, 8 Nov 62.

242. SSD (SSHKK) Ltr to multiple address, subj: Request for Authority to Extend Definitization Data and to Obligate Additional Funds - Letter Contract AF 04(695)-68, Agena D, 14 Nov 62.

243. SSD (SSH) Ltr to SSVZ, subj: Proposed NASA/Air Force Management Agreement, 14 Nov 62.

244. SSD (SSHKK) Ltr to multiple address, subj: Request Authorization for Letter Contract AF 04(695)-233, 16 Nov 62.

245. SSD (SSHGD) Ltr to 6595 ATW (Col Perry), subj: Umbilical Test Philosophy and Blanket Removal for SLV3/S-01A/Payload FSV, 26 Nov 62.

246. Msg (C/Gp4), Cite AFSSV-KQ 98986, 302127Z Nov 62.

247. SSD (SSH) Ltr to Lockheed, subj: First Article Configuration Inspection of S-01A/19, 6-23 Nov 1962, 12 Dec 62.

248. Historical Data - Jul-Dec 1962 from SSZAR to SSZA, 24 Jan 63.

249. NASA Ltr to Gen B. A. Schriever, 25 Jan 63.

250. Contractor Performance Evaluation Report on AF Contract AF 04(695)-21, with Lockheed Missile and Space Company, Sunnyvale, California, 14 Feb 63, (C/Gp4).

251. Ltr sgd Gen B. A. Schriever to Dr. Robert C. Seamans, Jr., 6 Mar 63.

252. Space Systems Division USAF S-01A Management Package, 20 Mar 63 (S/Gp3).

253. Msg, Cite MSFA 16-4-35, 161700Z Apr 63.

254. SSD (SSV) Ltr to Distribution, subj: Letter of Understanding Between NASA Lewis Research Center and USAF Space Systems Division for Transfer of NASA Agena Contracts, 9 May 63.

255. SSD (SSZAC) Ltr to SSZN and SP-206, subj: Configuration Control Management of Program S-01A Booster Vehicles, 19 Jun 63 (S/Gp4).

256. Msg Cite AFRSTD 76993, undated, and Msg Cite MSFA 15-7-22, 1520457 Jul 63.

257. AFSC (MSFAR) Ltr to multiple address, subj: Transmittal of Memorandum of Agreement, 20 Aug 63, w/1 Atch: USAF-NASA Memorandum of Agreement NASA Office of Space Sciences Agena Launch Vehicle Program, 9 Aug 63.

258. SSD (SSVA) Ltr (C/Gp4) to SSV, subj: Annual Report of Achievements (3 Oct 1962 - 3 Oct 1963), 27 Sep 63.

259. DOD News Release No. 1396-63, 21 Oct 63.

260. Msg Cite MSFA 7-11-6, 071956Z Nov 63.

261. Summary Report - Transfer of NASA Agena Programs from AFSSD to NASA LeRC, 31 Dec 63.

262. SSD (SSVAT Ltr to Hq AFSC (MSFA), subj: Summary of Transferred Agena Programs, 3 Jan 64.

263. SSD (SSVA) Ltr (Uncl w/o C/Gp4 Atch), subj: Historical Report: 1 Jul 1963-31 December 1963, 4 Feb 64, w/2 Atch.

264. SSD (SSVAC Ltr to SSVA (Col Blum), subj: Erection of Thor-Agena in Front of Building A, 16 Apr 64.

265. SSD (SSVA) Ltr (C/Gp4) to SSEH, subj: Historical Report, 1 January 1964-30 June 1964, 12 Aug 64, w/5 Atch: 1 (U); 2 (C); 3 (U); 4 (C); 5 omitted; 6 (C).

266. SSD (SSG) Ltr (Uncl w/o C/Gp4 Atch) to ARDC (DMSF MajGen Ritland), subj: Recent Agena Flight Problems, 12 Nov 64, w/1 atch: Proposed letter to Sec McMillan from Gen Schriever, w/1 atch.

267. SSD (SSG) Ltr (Uncl w/o C/Gp4 Atch) to AFSC (Gen Schriever, subj: General Dynamics/Astronautics Proposal to Increase SLV-3/Agena Payload Capability, 27 Nov 64, w/2 Atch; Atch 1 C/Gp4.

268. SSGA Memorandum for Generals Funk and Cooper (FOUO), subj: Request for Authority to Raise Major Agena Subcontractors to Associate Status, 10 Dec 64.

269. SSD (SSK) Ltr (C/Gp4) to AFSC and Hq USAF (in turn), subj: Request for Determination and Findings Pursuant to AFPI 3-214, 25 Jan 65.

270. SSD (SSVA) Ltr (C/Gp4) to SSEH, subj: Historical Report, 1 July 1964 - 31 December 1964, 5 Feb 65, w/5 Uncl Atch.

271. Gemini Atlas Agena Target Vehicle System, Management and Responsibilities Agreement between the National Aeronautics and Space Administration Manned Spacecraft Center and The United States Air Force Air Force Systems Command, Space Systems Division, Mar 65.

272. SSD (SSGA) MFR, subj: Biosatellite Program -- Call from Cols Pickering and Swan of AMD, 9 Mar 65.

273. Memorandum for Gen Funk, Thru Gen Cooper, from Col Hamilton, subj: Advanced Life Support Capsule, 2 Apr 65.

274. SSD (SSK) Ltr (C/Gp4) to AFSC and Hq-USAF (in turn), subj: Request for Determination and Findings Pursuant to AFPI 3-214, 25 May 65.

275. SSD (SSLO) Ltr to AFSC (SCOO), subj: Request for Organization Change - Gemini Agena Division (SSVAT), 29 Jul 65.

276. SSD (SSVA) Ltr (C/Gp4) to SSEH, subj: Historical Report, 1 January 1965 - 30 June 1965, 9 Aug 65, w/5 Atch: Atch 1 (C/Gp4).

277. Msg Cite SSG 10111, 20 Oct 65.

278. SSD (SSV) Ltr to SSGS (B/Gen Martin), subj: Program 206-II Agena Launch Capability Contract, 3 Nov 65.

279. AFSC Ltr sgd Gen B. A. Schriever to SSD (MajGen Funk) and AEDC (BrigGen Gossick), 22 Nov 65.

280. Msg Cite SSG 10125 Nov 65.

281. SSD (SSVA) Ltr (C/Gp4) to SSEH, subj: Historical Report, w/6 Atch: 1. (U); 2. omitted; 3 (U); 4. (U); 5 (C); 6. (U); 7. (C), 8 Feb 66.

282. SSD (SSK) Ltr to AFSC and Hq USAF, subj: Request for Determinations and Findings Pursuent to AFPI 3-214, 8 Jul 66.

283. SSD (SSVA) Ltr (Uncl w/o C/Gp4 Atchs 2, 4, 5 & 8), subj: Historical Report for the Period of 1 January 1966 - 30 June 1966, 29 Jul 66.

284. SSD (SSV) Ltr to SSGS (Gen Martin), subj: Agena Guidance and Control Subsystem Development, 1 Feb 67, (C/Gp3).

285. SSD (SSVA) Ltr (Uncl w/o C/Gp4 Atch 2, 7, 8 & 9) to SSV, subj: Historical Report, 1 Jul 66 to 31 Dec 66, 3 Feb 67.

286. DAF Ltr (C/Gp3) to SSVA, subj: Attitude Control System Configuration, 8 Feb 67.

287. DAF (SP-7B) Ltr to SSVA (Major Bell), subj: Standard Agena Allocation, 13 Feb 67.

288. AFRPL (RPG) Ltr to SSD (SSGV/Col D. V. Miller), subj: Advanced Agena Development, 26 Mar 67.

289. SSD (SSVAP) Ltr (S/Gp3) to SSEH (Mr. McClellan), subj: Users of Standard Agena Vehicle, 7 Apr 67.

290. SSD (SSVA) Ltr to SSV (Col Hamilton), subj: Improved Agena Development Program, 28 Apr 67.

290a. Briefing Charts (S/Gp3), Report of Special Board on Agena Procurement, SAFSP, 1 May 67.

290b. Msg (C/Gp3), Cite SSG 67-12, 24 May 67.

290c. Msg (C/Gp4), Cite SCSS 22931, 262111Z 67, May 67.

291. SSD (SSV) Ltr to SAFSP (Gen Martin), subj: SSD Position on SAFSP Proposal for a New Production Management Concept for Agena, 2 Jun 67.

292. MFR sgd Maj Robert R. Crawford, 7 Jun 67.

293. SSD (SSVA) Ltr (C/Gp3) to SSGS (Gen Martin), subj: Improved Agena Performance Requirements, 12 Jun 67.

294. DAF (SP-2) Ltr (C/Gp3) to multiple address, subj: Improved Agena, 15 Jun 67.

295. Lockheed Briefing Charts, subj: Customized Standard Agena, 21 Jun 67.

296. DAF (SP-1) Ltr (C/Gp3) to SSG (Gen Cooper), subj: Improved Agena, 23 Jun 67.

297. MFR sgd MajRobert F. Crawford, subj: Improved Agena Requirements Meeting, 28 Jun 67.

298. Briefing Charts on Agena D and E Management Problems, 11 Jul 67.

299. SAMSO (SMVA) Ltr (Uncl w/o C/Gp4 Atch 5 and 8) to SMV, subj: Historical Report, 27 Jul 67.

300. Program Plan, subj: Customized Standard Agena, Support Engineering Program Plam, Contract [redacted] 27 Jul 67. 50X1

301. Briefing Charts, subj: Standard Agena, 28 Jul 67.

302. SAMSO (SMVA) Ltr to SMGS (Gen Martin), subj: Agena D Contract Structure, 2 Aug 67.

303. SAMSO (S G) Ltr (C/Gp4) to SAFSP (Gen Martin), subj: Improved Agena Flight Test, 11 Aug 67.

304. DAF (SP-1) Ltr (C/Gp3) to SMG-2 (Gen Cooper), subj: Improved Agena Flight Test, 14 Aug 67.

305. SAMSO (SMV) Ltr to SAFSP (Gen Martin), subj: New Production Management Concept for Agena, 22 Aug 67.

306. DAF (SP-1) Ltr (C/Gp3) to SMG-2 (Gen Cooper), subj: Improved Agena, 30 Aug 67.

306a. SAMSO (SMG-2) Ltr (C/Gp3) to SMGS (Gen Martin, subj: Improved Agena, 7 Sep 67.

306b. DAF (SP-1) Ltr (S/Gp3) to SMG-2 (Gen Cooper), subj: New Production Management Concept for Agena, 8 Sep 67.

306c. Memorandum for Gen O'Neill (C/Gp4) sgd MajGen Paul T. Cooper, subj: New Production Management Concept for Agena, 18 Sep 67.

307. MFR sgd LtCol Allen J. Poor, subj: Custom Agena Briefing to Gen Martin, 19 Sep 67, w/1 Atch: Briefing Charts, subj: Custom Agena.

308. DAF (Sp-2) Ltr (S/Gp3) to SMG-2 (Gen Cooper), subj: Procurement of Agena for SAFSP, 20 Sep 67.

309. SAMSO (SMG) Ltr to SCOM-27 (Col F. G. Morris, Jr), subj: Manpower Packages for the Titan III S and the Agena Program Office, 10 Oct 67.

310. Msg (S/Gp4), Cite SCSSM 36065, 182134Z Oct 67.

311. DAF [redacted] Ltr (Uncl w/o S/Gp3 Atch) to [redacted] (LtCol Wheeler, subj: Agena D Flight Summary, 25 Jan 68, w/1 Atch same subj.

312. DAF [redacted] Ltr to SME, subj: Final Agena Historical Report, 1 July - 19 October 1967, 15 Apr 68.

313. List of Contracts (containing Estimated Face Value) (C/Gp4), subj: Agena Vehicle, undated.

Capt [illegible]

HEADQUARTERS
SPACE SYSTEMS DIVISION
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
Air Force Unit Post Office, Los Angeles 45, California

REPLY TO ATTN OF: SSZAR/Capt Hebert

SUBJECT: Historical Data - July-December 1962

JAN 24 1963

TO: SSZA

The following information is provided as requested in SSE letter, dated 10 December 1962.

a. Effective 1 July 1962, the Requirements and Programming Office was formed. This office combined the functions of Agena D Programming Division (SSHDL) and Agena B Requirements Branch (SSHAR) into a single office providing staff support to the Director. The SSD Organization and Function Chart Book, dated 1 July 1962, provides a functional description of the organization.

b. The Memorandum of Agreement, Subject: "Management Relationships between SSH-SSZI, SSZN, SSZX and LMSC," dated 5 September 1962, identifies areas of responsibilities between the programs.

c. Effective 14 September 1962, the S-01A Detail Specification was approved. This document is the basis for acceptance of S-01A vehicles and is the basic specification from which all programs using the S-01A vehicle prepare their detail specification.

d. SSH letter, dated 18 September 1962, Subject: "S-01A Vehicle Assignment to Using Programs," provided LMSC with direction that the S-01A Vehicles that were stored, after DD-250 acceptance, would be utilized by using programs on a "first-in, first-out basis."

Dean L. Kennedy
DEAN L. KENNEDY, Major, USAF
Chief, Requirements & Programming
S-01A Space Project Directorate

1 Atch
Memo of Agreement,
dtd 15 Sept 62

[illegible]

Cy to: SSD (Cdr W) 2/1/63 [illegible] Copy from SF (Col [illegible])

1, 2099

31 Jan 1963

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON 25, D.C.

Jan 25, 1963

JAN 28 1963

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IN REPLY REFER TO: SD

General B. A. Schriever, Commander
U. S. Air Force Systems Command
Andrews Air Force Base
Washington 25, D.C.

Dear General Schriever:

As indicated in NASA Headquarters' TWX 142102Z of December, management of the NASA Agena Program, excluding Gemini, has been transferred from the Marshall Space Flight Center to the Lewis Research Center. As a result of this action, Marshall and Lewis have been engaged in a cooperative effort during the month of January to effect the transfer with a minimum amount of disruption to the NASA Agena Program. The Gemini Atlas Agena target vehicle has been assigned to the Manned Spacecraft Center.

As of January 28, 1963, those NASA Agena functions previously assigned to Marshall with the exception of the Gemini target, will be transacted through Dr. S. Himmel, the Agena Systems Manager in the Lewis Research Center, Cleveland, Ohio. Marshall Agena Program personnel have been assigned temporary duty at Lewis to provide continued support to the newly established Lewis Agena group for the next few months as required.

(6) # 19 SS-1C

Sincerely yours,

Homer E. Newell, Director
Office of Space Sciences

CONFIDENTIAL

M 3663

[illegible]

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CONTRACTOR PERFORMANCE
EVALUATION REPORT
ON
AIR FORCE CONTRACT
AF 04(695)-21

WITH

LOCKHEED MISSILE & SPACE COMPANY
SUNNYVALE, CALIFORNIA

DOWNGRADED AT 3 YEAR INTERVALS;
DECLASSIFIED AFTER 12 YEARS.
DOD DIR 5200.10

14 FEBRUARY 1963

Lockheed Missile & Space Co
Sunnyvale, California

7 Nov 61
1 Feb 62

Mr. J. Shoenhair
Program Manager

04(695)-21

Air Force Space Systems Div.
Los Angeles, California

25 Aug 61	30 Nov 62	30 March 63	(See Narrative Para 3)
34,785,241	37,750,532	38,897,998	

CPIF x

S-01A

Agena D Space Booster

1. Develop and produce the Agena D as a standardized basic vehicle capable of performing a variety of space missions. The Agena D is capable of attaining a wide range and variety of orbital and space trajectories. It can perform as an intermediate stage booster, or as an orbital vehicle. An engine restart capability enables the Agena D to achieve precise, circular orbits, or permits the Agena D to make trajectory changes in space. The Agena D can be programmed to accomplish attitude changes. Its stabilization system, which may function actively or semi-actively, provides vertical as well as horizontal stabilization in orbital flights. Alternate adapters enable the Agena D to use either a Thor or an Atlas as a first stage booster. The Agena D is 23.3 ft in length and has a 5 ft diameter. It is powered by a Bell dual burn engine developing a rated thrust of 16,000 pounds with a nominal thrust duration of 240 seconds.

2. The Agena D design was directed toward a more reliable standardized space vehicle that could be used with minimum alteration by a number of using programs. Agena D design features also included the development of equipment accessibility, maintainability, and producibility. The contract also provided for a complete procurement package (specs, drawings, etc) to enable follow-on fixed price procurement plus a production capability of five vehicles per month. (See Narrative Para 1 and 2)

a. The Agena D design utilized flight proven Agena B equipment wherever possible to standardize major equipment, circuits, and plumbing. Re-packaging and re-location of equipment was required to provide ready access for checkout, removal or replacement. It was required that components be installed so that removal of a component could be accomplished without disturbing other components. System assemblies, such as FM Telemetry, guidance, and electrical power, were to be modularized for maximum interchangeability and simplified checkout.

B. Government furnished equipment.

ASQ-9 program comparator -- Bendix. This item was furnished the [illegible]

[illegible]

CONTRACTOR PERFORMANCE EVALUATION REPORT — TECHNICAL PERFORMANCE SUMMARY

TECHNICAL PERFORMANCE INDICATOR		COMMITMENT			CURRENT	CURRENTLY PROGRAMMED VARIANCE col(f)-col(c)
			AS ADJUSTED			
ITEM (a)	UNIT (b)	ORIGINAL (c)	CONTRACTUALLY (d)	PENDING & OTHER (e)	ESTIMATE / ACTUAL (f)	(g)
Reliability	%	Objective 90% ascent	See Narrative Summary Paragraph 4(a)			
Program Adaptability	--	See Narrative Summary Paragraph 4(b)				
Ease of Checkout	Hrs	See Narrative Summary Paragraph 4(c)				
Weight of Vehicle	Lbs	1307	1307	1307	* 1296.5	10.5 lbs Under
Ascent Performance	Many	See Narrative Summary Paragraph 4(e)				
* Based on actual average weight of all vehicles (Par 4(d))						

FORM 2500-2

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PERFORMANCE EVALUATION REPORT — SCHEDULE PERFORMANCE

ITEM OR DELIVERED EVENT (a)	COMMITMENT ORIGINAL (b)	MONTHS FROM ORIGINAL CONTRACT AWARD AS ADJUSTED: CONTRACTUALLY (c)	PERSONS & OTHER (d)	ACTUAL MONTHS FOR DAYS (e)	CONTRACTOR RESPONSIBILITY VARIANCE Col(e)-Col(c) MONTHS (f)	Col(f) ÷ Col(c) % (g)	
Integration Plan - per Section III Par 2(a) Exhibit 648B-100	1	1	1	1	None LATE EARLY	None LATE EARLY	
PTV Test Plan - per Section III Par 2(d) Exhibit 648B-100	1	1	3	3	None LATE EARLY	None LATE EARLY	
50% First Configuration Freeze per Section IV Par 2(c) Exhibit 648B-100	1	1	1	1	None LATE EARLY	None LATE EARLY	*
100% Configuration Freeze per Section I Par 2(c) Exhibit 648B-100	10	10	10	10	None LATE EARLY	None LATE EARLY	*
Agena D Detail Specification per Section IV Par 1(a) Exhibit 648B-100	5	5	5	5	None LATE EARLY	None LATE EARLY	*
Specs. and Drawings Ref. in Detail Spec. per Section IV Par 1(a) Exhibit 648B-100	7	7	7	9	2 [✓ LATE] EARLY	29% [✓ LATE] EARLY	*
Environmental Specification per Section IV Par 1(b) Exhibit 648B-100	4	4	4	4	None LATE EARLY	None LATE EARLY	
Performance Specification for Factory Check Out Equipment Sec IV Par 1(d)					LATE EARLY	LATE EARLY	
-5 (Manual Complex)	2	2	2	2	None LATE EARLY	None LATE EARLY	
-3 (Manual Complex)	6	6	6	7	1 [✓ LATE] EARLY	16% [✓ LATE] EARLY	
FACE (Factory Agena Checkout Equip)	7	7	7	7	None LATE EARLY	None LATE EARLY	
Aero, Thermo Structural & Elect loads, stress /balance/inertia analysis per Sec IV Par 1(e) Exhibit 648B 100	9	9	9	10	1 [✓ LATE] EARLY	11% [✓ LATE] EARLY	
Reliability Plan - Per Section VII Par 1 Exhibit 648B-100	1	1	1	1	None LATE EARLY	None LATE EARLY	
First Agena D Delivery per Exhibit B Appendix A	5	5	5	5	None LATE EARLY	None LATE EARLY	
First Launch Agena D per Air Force schedule at inception of contract	7	7	7	7	None LATE EARLY	None LATE EARLY	

[illegible] PERFORMANCE EVALUATION REPORT					SCHEDULE PERFORMANCE	
ITEM TO BE DELIVERED OR PROGRAM EVENT (A)	COMMITMENTS ORIGINAL (B)	MONTHS FROM ORIGINAL CONTRACT ESTABLISHMENT AS ADJUSTED CONTRACTUALLY (C)	BEYOND [illegible] (D)	ACTUAL MONTHS FROM AWARD DATE (E)	CONTRACTOR RESPONSIBILITY VARIANCE Col(E)-Col(C) MONTHS (F)	Col(F) [illegible] % Col(D) (G)
ena [illegible] umber 12 (last vehicle) r Exhibit 648B, Appendix A	10	10	10	10	None LATE EARLY	None LATE EARLY
ilestones established by Air Force d contractor Program Directors					LATE EARLY	LATE EARLY
ake-or-buy Proposal	1/2	1/2	1/2	1/2	None LATE EARLY	None LATE EARLY
hen C. [illegible] quote	1	1	1	1	None LATE EARLY	None LATE EARLY
ctory cceptance systems st specification (LMSC-1412955)	3	3	3	3	None LATE EARLY	None LATE EARLY
unctional Mockup Completed	3	3	3	3	None LATE EARLY	None LATE EARLY
ropulsion Test Assembly Hot Fire tisfactorily Completed	3	3	3	3	None LATE EARLY	None LATE EARLY
remat Completed on Development est Vehicle Structures	3	3	3	3	None LATE EARLY	None LATE EARLY
ropulsion Test Vehicle Assembly Test ycle Completed at Santa Cruz	4	4	4	4	None LATE EARLY	None LATE EARLY
ehicle Acceptance Test Specification	5	5	5	5	None LATE EARLY	None LATE EARLY
imulated Launch and Flight Systems est Completed for Agena D No. 1	5	5	5	5	None LATE EARLY	None LATE EARLY
evelopment Test Vehicle Program SCTA Completed	7	7	7	7	None LATE EARLY	None LATE EARLY
l Components Fully Qualified Prior First Launch	7	7	7	7	None LATE EARLY	None LATE EARLY
					LATE EARLY	LATE EARLY
					LATE EARLY	LATE EARLY

#76.

CON[illegible]TOR PERFORMANCE EVALUATION REPORT — COST PERFORMANCE

PAR[illegible] A TERMINAL EVALUATION – OVERRUN / UNDERRUN STATUS

TA[illegible]	[illegible]T PRICE		ACTUAL	CONTRACTOR RESPONSIBILITY VARIANCE		(g) REMARKS
	[illegible]ADJUSTED					
[illegible] (a)	[illegible] (b)	[illegible] (c)	(d)	AMOUNT (e)	OVERRUN (UNDERRUN) % (f)	
		$	$	$	%	

PAR[illegible] B. PERIODIC EVALUATION – OVERRUN / UNDERRUN STATUS

TARG[illegible]	PRICE		Cost to Completion GRANTED	CONTRACTOR RESPONSIBILITY VARIANCE		(g) REMARKS
	[illegible]ADJUSTED					
[illegible] (a)	[illegible] (b)	PENDING [illegible] (c)	(d)	AMOUNT (e)	OVERRUN (UNDERRUN) % (f)	
34.1	37.7	$ None	$ 38.9	$ 1.2	3.1 %	See Narrative Summary (See para. 6)

PAR[illegible] C PERIODIC EVALUATION – COST EFFECTIVENESS

COST OF WORK						(g) REMARKS
WO[illegible] PERFORMED TO [illegible] $			TOTALS AT COMPLETION $			
[illegible] (a)	[illegible] (b)	OVERRUN (UNDERRUN) (c)	CONTRACT ESTIMATE (d)	LATEST REVISED ESTIMATE (e)	PROJECTED OVERRUN (UNDERRUN) (f)	
						No cost effectiveness data available

NARRATIVE

1. In order to provide reviewing agencies the proper perspective of this contractor's performance and the Agena D Contract, it is necessary to include a brief background of events leading to and included in the contractual arrangements.

Early in 1961, increased activity and mounting costs of space programs forced recognition by AFSSD of the necessity for reducing cost and increasing flexibility through standardization of the Agena stage. In order to establish the technical feasibility of this approach, on 30 June 61, the Agena Standardization Study was authorized. The results of this study were favorable and after approval by Hq USAF and DOD, on 25 August 61 the U.S. Air Force awarded Contract AF 04(695)-21 to the Lockheed Missiles and Space Company for the design, development, and production of twelve Agena D satellite vehicles which were to be standard in nature and capable of being used with a minimum degree of change in various satellite programs. First launch was scheduled for January 1963.

On 17 October 61 the Honorable Dr. Joseph V. Charyk, Under Secretary of the Air Force, appointed a special committee chaired by Mr. Clarence L. Johnson to investigate ways and means of providing a more reliable Agena on an accelerated schedule. This committee reviewed the approach proposed under the standard Agena concept and the capacity of the Lockheed Missiles and Space Company for accelerating the approved schedule. It was the conclusion of the committee that a more reliable standard Agena could be produced to support a June 62 first launch provided that extraordinary and unusual technical and contractual relationships were established and rigorously adhered to by both the Contractor and the Government. The management principles proposed by the Johnson Committee were reviewed by Hq USAF and approved as the basis for program management. In general, these ground rules apply a streamlined AF/Contractor management concept and include a DX priority, reduction in formal procedures, exclusion area in which to perform the work, and extraordinary program management channels. To insure compliance by both parties, these 'ground rules' were actually made a preamble to the contractual work statement for the accelerated Agena D program.

2. Incentive Features of the Contract.

a. In conformance with DOD policy, it was established from the outset of the Agena D program that the research and development phase was to be contracted as a Cost Plus Incentive Fee contract.

b. The features to the negotiated incentive formula for computation of fee are as follows:

1. Division of Fee: Equal weight will be given to cost, schedule, and performance (1/3) each.

2. Costs: Based upon a target fee rate of 7% for cost and a contract target cost of $31,713,746, theContractor will receive $739,987 if the final contract cost is $31,713,746. If the final cost of the contract is 5% more than the target price, the Contractor's fee will be reduced by $31,714; if 10% more, it will be reduced by $63,428; if 15% more, it will be reduced by $116,283 at which point fee rate reaches the minimum of 5%.

A like procedure applies to underruns. If the final cost is 5% less than the target price, the Contractor's fee is increased by $31,714; if 10% less, the fee will be increased by $63,428 etc.

3. Schedule: As to vehicle delivery, the Contractor will receive 9% or $951,412, based upon a target cost of $31,713,746, if all vehicles are delivered to contract delivery schedule. To permit correction of all reported discrepancies resulting from Air Force Acceptance inspections and to permit delivery of a 'clean' article, the delivery formula provides a two-week grace period without penalty; if late more than two weeks, the fee is decreased by .0222% of target cost per week for five weeks to a maximum penalty of .111% of target cost per vehicle. If all twelve vehicles are seven weeks or more late, the fee would be reduced to 5% of target cost or $528,562. A detailed procedure has been evolved to determine the actual date and time of 'final' acceptance and delivery for fee purposes.

4. Performance: One of the most significant and unique features of the negotiated incentive fee relates to the payment of the 1/3 fee based upon performance. The Contractor proposed and the Air Force accepted the principle that the Air Force would unilaterally rate the Contractor's performance. LMSC officials suggested a set of criteria as the basis for rating which were similar but not identical to those finally arrived at through negotiation. It is now agreed that the 1/3 fee based upon performance shall be by a point rating system. If the Contractor's performance is rated the maximum of 60 points, the fee for performance will be based upon 9% of target cost of $31,713,746, or $951,412; a performance rating of 30 points gets the target fee of 7% or $739,987; a performance rating of 0 points gets the minimum rate of 5% or $528,562.

An Air Force board composed of representatives of the using programs and the Agena D Program Office will be appointed by the Commander, AFSSD, to rate the Contractor's performance within 30 days of the launch of the twelfth prototype vehicle. The board will use the following criteria: 30 points for (1) Reliability, (2) Program Adaptability, (3) Ease of Checkout; 30 points for (1) Weight of Vehicle, (2) Ascent performance.

Additionally, it has been mutually agreed between the Contractor and the Agena D Program Office that should failure to qualify all components of the Agena D vehicle prior to flight of each of the prototype vehicles delay the flight of any vehicle, a suitable adjustment of the performance fee will be made. This will be the first time that the Agena vehicle will be contractually required to have all components qualified for flight prior to flight.

3. The completion date of 30 November 1962 for this contract has been extended by the Air Force. The purpose of this extension is to allow the contractor to complete reliability life tests and selected evaluation items in support of the Agena D research and development contract. All remaining effort to complete this contract is being monitored on an individual item basis with a goal of clearing all open items by the current scheduled completion date.

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1. The contractors performance under contract AF 04(695)-21 is to be rated against the following criteria as specified under Paragraph V Performance of Exhibit "A" to the subject contract. Groups I and II have equal weight with 30 points available to each. The points available to each item are as follows:

Group I Criteria

(1) Reliability - 22 points available
(2) Program adaptability - 4 points available
(3) Ease of checkout during manufacturing, systems test, and launch operation - 4 points available

Total available - 30 points
Target 15 points

Group II Criteria

(1) Weight of vehicle - 15 points available
(2) Ascent performance - 15 points available

Total available - 30 points
Target 15 points

The twelve (12) vehicles to be evaluated are to be used in programs 162 and 698BK. Each vehicle will be evaluated against the using programs' requirements applicable within the scope of the -21 work statement. Therefore, the portion of the above "points available" for each item to be assigned to either program will be in proportion to the number of vehicles that program will launch. Out of the total of 22 points for reliability, for example, since 162 will launch 10 of the 12 Agena D's, 10/12 of the 22 points will be derived from the demonstrated reliability in Program 162 and 2/12 of the 22 points will stem from 698BK performance.

2. Reliability Rating System

No numerical reliability has been agreed upon as a requirement. Since the -21 work statement states, "The basic objective shall be to produce a more reliable standardized basic vehicle capable of performing - - -", a means of comparison was constructed for the purpose of evaluating reliability.

Program 162 Reliability. Each Program 162 Agena D vehicle which achieves orbit, maintains attitude control to the most optimum recovery orbit on the 4th day after launch, and reorientates the re-entry vehicle (RV) in the nose down attitude is given a score of 1. Should a failure or pending failure in the Agena D require that recovery be attempted on the 3rd day the score will be 3/4, necessity for a 2nd day recovery [illegible] will yield a score of [illegible], and a 1st day attempt will yield [illegible] [illegible] Agena D which precludes recovery will yield a score of 0 for that vehicle. These scores will be summed to result in a total score, D.

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An equal number of the last 162 Agena D's will be scored against the same criteria to yield a total score, B, to be used as the comparison control.

A ratio will be made of the total scores (B & D) such that the result will be a number less than one. The determination of the number of reliability points to be supplied by 162 results, P, will be computed from the formula

$$P = \underline{10}\ (11)\left(\frac{D}{B}\right); \quad D < B$$

or

$$P = \frac{10}{12}\ (11)\left(2 - \frac{B}{D}\right); \quad B < D$$

The maximum reliability points for 162 is 18 1/3 with a target of 9 1/6.

Program 698BK Reliability. Program 698BK will use 2 of the 12 Agena D's for ascent missions. The reliability will be evaluated purely on the basis of whether or not an orbit was obtained and compared with the results of vehicles 2301 and 2312 (both of which made orbit). The score is 1 for attaining any orbit and 0 for failure to orbit. The quality of the orbit for 698BK is to be evaluated under ascent performance criteria; therefore, the lack of second burn on 2301 and the resulting "out of spec" final orbit would not be evaluated under reliability. Boost performance is the only consideration since the orbital functions of these vehicles will result from program peculiar modifications or use of Agena D equipment which is hardly "derived from common mission requirements." The Agena B performance can be computed at the present time, i.e., B for this program is 2 and the number of points to be supplied by Program 698BK is given by $P = \frac{2}{12}\ (11)\left(\frac{D}{B}\right); \quad D \leq B$. The situation where B D is impossible because B is 2 and D cannot be larger.

b. Program Adaptability Rating System

For this criteria item there is no basis for comparison in the Agena history and no obvious numerical method by which to rate; therefore, the rating scale is constructed from the qualitative opinions of those persons charged with adapting the standard Agena to a program configuration, i.e., with negligible or zero modification. The score will be -1 if the subsystem is adaptable with small modifications. The total range is therefore -5 to +5 for each using program. The points to be assigned to this item for both Programs 698BK and 162 will be computed using the formula:

$$P = \left(2 + \frac{X_1}{5}\right)\frac{2}{12} + \left(2 + \frac{X_2}{5}\right)\frac{10}{12}$$

where X_1 is the signed score for adaptability as determined by the 698BK [illegible] and X_2 is the [illegible] 162 users.

c. Ease of Checkout Rating System

[illegible] the vehicle is considered as a whole and as the integration of [illegible]

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either being harder, about the same, or easier to checkout than the comparable Agena B subsystem, and accordingly will be given scores of -1, 0, or +1. These conclusions to be reached by AF personnel after interviewing test and checkout personnel. Considering Subsystems A, B, C, D and the vehicle as a whole, the possible range of the score is from -5 to +5 for each of 3 categories, e.e., manufacturing, system test and launch base. The total range is therefore -15 to +15. The points to be assigned to this item for both Programs 698BK and 162 will be computed by the formula:

$$P = \left(2 + \frac{X}{15}\,2\right)\frac{(698BK\ Veh)}{12} + \left(2 + \frac{Y}{15}\,2\right)\frac{(162\ Veh)}{12}$$

where X is the signed score for this item as determined in the 698BK Program to Y is the signed Program 162 score.

d. Weight of Vehicle Rating System

It has been agreed between SSD and LMSC that 1307 pounds is the accepted Committed Equivalent Weight (CEW) for the Agena D in determining contractual weight compliance. Therefore, any Agena D C.E.W. less than or equal to 1307 pounds satisfies the requirement and shall receive the maximum points in this area.

e. Ascent Performance Rating System

The ascent performance is scored against the quality of achieved orbits versus predicted spec deviations. The orbital elements of altitude of perigee, period, and inclination angle will be scored. It is assumed that the operation of the main stage booster is within specified limits and any adverse operation is not cause for penalizing the Agena D performance.

The Contractor states a spec valve as that deviation associated with the probability of a three sigma deviation, of a normally distributed random variable. Fixing the zero deviation of any of the three orbital elements to the end of the points scale which will yield maximum score, and the 3 sigma deviation to the end which yields zero score, the score is then computed by a relation which assigns score in proportion to the probability remaining under a normal curve outside of the observed deviations.

The appropriate number of points out of the 15 available can be computed thus:

$$P = \frac{10}{12}\overline{(R_h + R_\tau + R_i)}^{162}\,5 + \underline{2}\,\overline{(R_h + R_\tau + R_i)}^{698BK}\,5$$

where the R's are the probabilities of exceeding a plus or minus value equal to the observed deviation of altitude of perigee for R_h, period [illegible], and inclination [illegible].

The 50% design freeze was accomplished on schedule on 1 December 1961. This was followed by a vehicle equipment list on 3 January 1962, a design freeze and review on 8 January 1962 with complete engineering release on 20 January 1962. The 100% configuration freeze; reference item 4, DD Form 2500-3, applies to the configuration of the first production vehicle scheduled for and delivered in September 1962. The configuration was frozen on schedule, but the documentation reference Item 5 and 6, DD Form 2500-3, did not comply with Air Force requirements for configuration control. To determine the adequacy of this documentation, a first article configuration inspection (FACI) was performed on the first production vehicle in September 1962. Results of this FACI were unsatisfactory and the contractor was directed to complete the documentation required by Air Force regulations to support configuration control procedures. Another FACI was held in November 1963, at which time the Air Force accepted the contractor documentation.

The contractor's performance evaluation report DD Form 2500-3 only includes the first and last vehicle delivery schedule. All twelve Agena D's on this contract were delivered on or before scheduled delivery, reference; Appendix A, Exhibit 648B-100 to Air Force Contract AF 04(695)-21.

6. LMSC first cost variance filed 11 Sept 1962 was in the amount of $383,198 and the basic reason for the increased costs on Contract AF 04(695)-21 are summarized as follows:

a. Certain multiple or second source items were procured which were not covered by contract changes as anticipated.

b. Contractor accomplished changes in basic telemetry design and materials without seeking additional contract changes.

c. Material costs were substantially increased as the result of certain design changes which were required to meet specifications and insure a deliverable high quality product.

d. Additional production costs were incurred for tooling and design redraw resulting from aforementioned changes.

e. The recent change in Contractor's accounting system resulted in higher overhead costs on this particular contract.

LMSC second cost variance in the amount of $759,466 was processed 24 Jan 1963. The actual cost overrun was attributable primarily to the following:

a. Recent changes in the Contractor's accounting system resulted in higher overhead charges to this particular contract.

b. Unforeseen additional tooling costs occasioned by a change in vehicle configuration subsequent to Vehicle No AD8 and incorporation of complete S-01A capability within the LMSC complex.

c. Under estimated cost relating to implementation and capability maintenance for PAM telemetry required by the contract.

d. Under estimated costs relating to redesign and retrofit effort toward incorporating state-of-the-art changes and improvements when possible.

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SPACE SYSTEMS DIVISION

UNITED STATES AIR FORCE

S-01A MANAGEMENT PACKAGE

DOWNGRADED AT 12 YEAR
INTERVALS; NOT AUTOMATICALLY
DECLASSIFIED. DOD DIR 5200.10

20 March 1963

SSZA-1186

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FOREWORD

1. This document is submitted in conformance with AFSC Program Management Instruction (PMI) 2-8.

2. Hq USAF has directed that the S-01A Program be funded incrementally with using program funds. The individual vehicle users transfer program dollars to fund the USAF directed S-01A production rate. Any program fluxuations (slippage, cancellation, fund release, etc.) result in chain reaction re-programming action.

3. This plan is submitted to obtain line item funding to sustain the directed S-01A production rate during FY 64 and subsequent years.

4. This plan was reviewed by the SSD Program Budget Review Committee (PBRC) on 13 March 1963 and the Hq USAF/AFSC Joint Review Team (JRT) on 18 March 1963 and received their approval.

EDWARD F. BLUM
Lt Colonel, USAF
S-01A Program Director

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SECTION I

PROGRAM SUMMARY

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SECTION I

S-01A MANAGEMENT PACKAGE SUMMARY

I. SUMMARY

A. Vehicle Description

1. The S-01A is a standardized second stage booster capable of performing a variety of space missions. It is capable of attaining a wide range of orbital and space trajectories and can be used as an intermediate stage booster, or as an orbital vehicle. An engine restart capability enables the S-01A to achieve precise circular orbits and permits trajectory changes in space. It can also be programmed to accomplish attitude changes.

2. The S-01A stabilization system, which may function actively or semi-actively, provides vertical as well as horizontal stabilization in orbital flights. Alternate adapters enable the S-01A to use either a Thor or an Atlas as a first stage booster. The S-01A is 23.3 feet in length and has a 5 foot diameter. It is powered by a Bell dual burn liquid rocket engine developing a rated thrust of 16,000 pounds with a nominal thrust duration of 240 seconds.

B. Authorization

1. Hq USAF Message (AFSDC-F 82350) dated 30 November 1961 authorizing 12 R&D vehicles, procurement package, and a production capability of 5 vehicles per month.

2. Hq USAF Message (AFSSV-EQ-90915) dated 5 January 1962 authorizing 39 production vehicles at a 4 vehicle/month rate.

3. Hq USAF Message (AFSSV-66176) dated 18 July 1962 authorizing 22 additional production vehicles at a 4 vehicle/month rate.

4. Hq USAF Message (AFSSV-EQ-14-62-117) dated 29 October 1962 authorizing 24 additional production vehicles at a 4 vehicle/month rate.

5. Hq USAF Message (MSFA-9-1-12) dated 9 January 1963 changing the production rate to 3 vehicles per month effective in July 1963.

6. Total vehicles authorized to date equal 97 S-01A's with deliveries at 3 vehicles per month from July 1963 through October 1964.

C. Vehicle Requirements

The S-01A production rate is established based on forecast DOD and other agency using program requirements. (Reference Section 3 and Appendix No. 1 this document). The established production rate is periodically reviewed in light of changing program requirements, with the production rate altered on an orderly basis to reflect new require-

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ments. It is not the intent to interrupt the orderly production flow established in reaction to minor changes in program requirements. This controlled production rate provides all the economies associated with a fixed price assembly line operation. The production rate can be changed on an orderly basis with a six month lead time.

D. Funding Requirements

1. The established funding procedures for procurement of S-01A vehicles and launch services, based on projected requirements, incur yearly costs that have to be funded with using program dollars. These costs do not change due to program fluctuations during the fiscal year, and as such become relatively fixed costs. As programs are approved and funds released, these identified (fixed cost) funds are allocated to support this effort. From this initial programming exercise any deviation to the overall space activity during the fiscal year (i.e., program approval, fund release, slippage, cancellations, etc.) requires re-programming action.

2. This management package is being submitted to identify the S-01A vehicle and launch services costs by fiscal year to obtain line item funding for these costs.

E. Launch Services

1. Launch Services constitute those services and materials required to launch and to maintain the capability to launch Program S-01A space vehicles at Vandenberg Air Force Base, Pacific Missile Range and Atlantic Missile Range. This effort involves system and subsystem checkout, servicing and launch of the Satellite System and those associated activities necessary to support this effort such as: AGE maintenance, equipment modifications, reports and documentation, "Blue Suit" training, spares provisioning, handling of propellants, equipment calibration, supply, etc.

2. Launch Complexes servicing the S-01A flight test vehicles are as follows:

Vandenberg Air Force Base

75-1, Pad 1 and 2
75-3, Pad 4 and 5

Pacific Missile Range

PALC-1, Pad 1 and 2
PALC-2, Pad 3 and 4

Atlantic Missile Range

Launch Complex 12
Launch Complex 13
Launch Complex 14

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SECTION II

VEHICLE DESCRIPTION

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II. S-01A VEHICLE DESCRIPTION

A. Purpose and Capability

1. The S-01A has been developed as a standardized vehicle capable of performing a variety of space missions. The concept that permits optional equipment to be combined with, or installed in place of, the basic equipment on a standardized vehicle enables the S-01A to display a versatility not provided in other vehicles or in earlier Agena models. This improved design simplifies manufacture, maintenance, launch preparation, and space operation.

2. The S-01A is capable of attaining a wide range and variety of orbital and space trajectories. It can perform as an intermediate stage booster, or as an orbital vehicle. An engine restart capability enables the S-01A to achieve precise, circular orbits, or permits the S-01A to make trajectory changes in space. The S-01A can be programmed to accomplish attitude changes. Its stabilization system, which may function actively or semi-actively, provides vertical as well as horizontal stabilization in orbital flights. Alternate adapters enable the S-01A to use either Thor or an Atlas as a first stage booster.

B. S-01A Vehicle Systems

1. S-01A incorporates five systems that perform the basic vehicle functions. These systems are: spaceframe, propulsion, electrical, guidance and control, and electronics. A brief description of each system is contained in paragraphs 2 through 6.

2. Spaceframe. The vehicle spaceframe consists of four major sections: forward section, tank section, aft section, and booster adapter section. The spaceframe provides the aerodynamic and structural shape of the S-01A vehicle and houses and supports the various vehicle system components and modules.

a. The S-01A forward section carries guidance, flight control electronics, telemetry, command, tracking, electrical power, and propellant pressurization equipment. The forward section also provides mounting provisions for payload and optional equipment. Equipment installed in the forward section is readily accessible. Removable doors permit easy access to test plugs and components for checkout or replacement. The telemetry, guidance, and electrical power components are module mounted for simplified checkout and interchangeability. Equipment that is not module mounted is readily accessible and can be removed without disturbing other equipment already installed.

b. The S-01A tank section stores the fuel and oxidizer necessary for operation of the main rocket engine. The tank section also provides the aerodynamic surface and supporting structure between the forward and aft sections. The dual-chamber assembly is integrally constructed so that the outer surface of the tank assembly forms a portion of the vehicle exterior surface.

c. The aft section is the structural portion of the S-01A vehicle to which the rocket engine, ullage rockets, and pneumatic attitude control thrust valves are attached. Because of the tension loading design, the aft section is a lightweight structure with a high load capability. Ready access to all parts of the engine, plumbing, and wiring is made possible by the aft section open-frame design.

d. The booster adapter section is the interconnecting structure between the S-01A vehicle and a first-stage booster. Prior to separation of the S-01A vehicle from the first-stage booster during flight, the adapter section encloses the vehicle aft section. Two retrograde rockets which effect separation of the S-01A vehicle and the first-stage booster are mounted in the adapter section and are enclosed by exterior fairings. A vehicle self-destruct system is also installed in the adapter section.

3. Propulsion System. The propulsion system consists primarily of a rocket engine and various components which support engine operation in developing a rated thrust of 16,000 pounds. The engine has start, shutdown and single restart capability and is designed for a nominal thrust duration of 240 seconds. The propellants utilized for engine operation are unsymmetrical dimethylhydrazine (UDMH) as the fuel and inhibited red fuming nitric acid (IRFNA) as the oxidizer. The propellant tanks are helium pressurized to suppress cavitation of the propellant turbopumps. Solid propellant ullage orientation rockets mounted on the vehicle aft equipment rack are fired prior to each engine ignition to insure proper orientation of the propellants in the tanks. Also included in the propulsion system are the propellant and helium fill and vent couplings, the helium control valve, the turbopump lip seal regulator valve, and various pyrotechnics.

4. Electrical System. The electrical system supplies various types of electrical power to operate S-01A and some using program equipment from prelaunch until the end of vehicle active life. The system consists of primary batteries, AC and DC power conversion and control equipment, wiring harnesses for all power and signal circuits, and separate circuitry for the pyrotechnic and destruct functions. Optional equipment available for the system permits variations in battery power and a capability to measure power consumed in flight.

5. Guidance and Control System. The guidance and control system consists of an infra-red horizon sensor, a body bound inertial reference package, sequence timers, flight control electronics, junction boxes, a velocity meter, pneumatics and hydraulics equipment. The sequence timer and the electronics circuitry contained in the flight control electronics and the junction boxes provide the ability to accommodate a variety of programmed operations. Attitude control signals are generated by means of the horizon sensor, gyro-compassing techniques and pre-programmed events. Actual vehicle control is achieved by means of hydraulically gimballing the rocket engine and cold gas thrust valves. A velocity meter is used to measure pre-selected velocities to be gained and to provide an engine shutdown signal when the correct velocity has been reached. Attitude reference is provided by the horizon sensor and the inertial reference package. The system has the necessary capability to establish the proper S-01A trajectory for attaining a desired orbit and to stabilize the satellite in four orientations in space. These orientations are nose up, nose down, nose forward, or nose backward.

6. Electronics System. Electronics system equipment installed in the S-01A is used in conjunction with the ground-based communications and control network to provide command and orbital programming, gathering and transmitting telemetry data, and tracking functions. The S-Band beacon and 15 channel decoded system provides tracking and real time command and the alternate C-Band beacon system provides only track capability. Telemetry from the basic S-01A and payload is provided by the option of either a 18 channel FM/FM system or a PAM system consisting of 16 main channels and a 128 channel sub-multiplexer.

C. S-01A Basic and Special Features

1. S-01A design has been directed toward production of a more reliable and standardized space vehicle that could be used with a minimum of alteration by a number of using program organizations. Since the using program requirements vary as to performance of ascent, orbital, and space functions, the S-01A must be capable of performing various missions without major structural modification. S-01A design features have also included the development of equipment accessibility, maintainability and producibility.

2. The S-01A makes use of flight proven S-01 equipment wherever possible to standardize major equipment, circuits, and plumbing. Equipment is located so that it is readily accessible for checkout, removal, or replacement. Equipment components are installed so that removal of a component may be accomplished without disturbing other components. Certain system assemblies, such as the FM telemetry, guidance and electrical power, are modularized for maximum interchangeability and simplified checkout.

D. S-01A Equipment Description

1. To meet the requirements of performing various mission functions, the S-01A vehicle utilizes three categories of equipment.

These categories are basic equipment, optional equipment, and program or mission peculiar equipment. The basic S-01A vehicle consists of structure and equipment which are common to most of the using space programs. S-01A flight capability is provided by installing a group of qualified optional flight items and adding a first-stage booster vehicle. The mission capability is then established by installing a second group of items identified as program or mission peculiar items.

2. Basic Equipment. Basic equipment, that which is required for most of the programs using the S-01A, consists of essential items of structure and equipment nexessary to perform basic ascent, orbital, or spatial functions. Basic equipment includes items that are required in the vehicle spaceframe, propulsion, electrical, guidance and control, and electronics systems to achieve the common mission. For example, the rocket engine, propellant tanks, wire harnesses, and guidance module are items of basic equipment. A "Basic S-01A Vehicle" has everything required for an elementary ascent mission except for payload, nose fairing, batteries, beacon, and telemetry transmitter. Certain launch-base-installed basic equipment items such as the pyrotechnics and engine nozzle extension are transported directly to the launch base for installation in the S-01A vehicle during launch preparations.

3. Optional Equipment. Add-on extras required by more than one using program are designated as optional equipment and facilities for installation are provided in this basic vehicle. A group of fully qualified optional extras are manufactured by the S-01A program and provided in kit form. Optional equipment kits are designed to perform specific functions, such as delayed engine restart, command destruct, or propellant dump. The kits are complete installations, that is, they include the wiring, bracketry and plumbing necessary for installation and operation. Mounting provisions for optional equipment kits are provided in the basic S-01A to permit installation without disturbing other equipment or components.

4. Program Peculiar Equipment. Program peculiar equipment is that equipment other than basic or optional that is essential to perform the requirements of a particular program mission. This equipment is in the form of add-on assemblies for which space, but not mounting provisions, is provided in the S-01A vehicle. Each program is expected to supply, as required, a program peculiar forward assembly consisting of appropriate nose fairing, fairing attach structure, payload, payload mating structure, and separation devices (if required). The program peculiar equipment supplied, developed, and qualified by the using program may also include special guidance or control equipment such as reaction wheels, secondary propulsion system, etc. To the maximum degree possible, this equipment is located so as to prevent sacrificing the ability of the S-01A to

form common functions. Use of space available in the aft equipment rack follows the same technique with the further restriction of volume and shape imposed by the adapter-aft rack environment.

E. Program Configuration of S-01A Vehicles

1. General Concept. The S-01A vehicle configuration employed by a particular using program bears the name of that program. The program configuration consists of a "basic" S-01A to which selected "optional" and "program peculiar" items of structure and equipment have been added. Instances may occur where not all the equipment supplied with the basic S-01A is required in the program configuration. This may be due to mission peculiarities or to the inclusion of optional kits which substitute alternate equipment items or change equipment requirement. In these instances, to avoid weight and space penalties, specific items that are designated as "permissible removals" may be removed.

2. Vehicle Assembly Procedures. The basic S-01A is assembled into the defined configuration and tested by S-01A Manufacturing. At this point the vehicle is "sold" to the Air Force Satellite Systems Division (AFSSD) by DD250 procedure. Thereafter, the basic vehicle is assigned by AFSSD to a using program, as Government Furnished Equipment (GFE). Optional and program peculiar equipments are now installed in the basic S-01A vehicle to adapt it for a given mission. In addition, selected items may be removed from the basic vehicle; these are identified as "Permissible Removal" in the basic vehicle master breakdown.

SECTION III

III. MASTER SCHEDULES

A. The projected S-01A vehicle requirements are based on the current AFSSD master schedule (Master Schedule #20, dated 12 Nov 62) updated to 12 March 1963. These vehicle requirements are based on the launch schedules and time phased to allow for program peculiar requirements.

B. The S-01A vehicle requirements versus production rate are reflected on the master schedule chart on the following page. The vehicle requirements shown on this chart are totals, specific using program requirements appear in the sensitive appendix. (See Appendix #1).

C. Vehicle requirements are forecast through FY-64, with the FY-66 through FY-68 period carried as unknown. The production rate is forecast at a 3 vehicle per month rate through FY-68 and all financial data is based on this rate. Total vehicles authorized to date equal 97 S-01A's with deliveries scheduled through October 1964. The production rate can be varied to respond to changing overall space requirements with a six month lead time.

D. The AFSSD policy in the assignment of production S-01A vehicles to using programs is based on a revolving inventory concept. This establishes a first in-first out assignment of vehicles to meet using program requirements. A vigorous adherence to this policy is required to negate storage obsolescence due to fluctuations in using program requirements.

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SECTION III

MASTER SCHEDULES

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S-01A REQUIREMENTS VS DELIVERY SCHEDULE

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S-01A

S-01A	FY-63						FY-64					
CY-63	J	F	M	A	M	J	J	A	S	O	N	D
1												
2 PRODUCTION	4	4	4	4	4	4	3	3	3	3	3	3
3												
4 AIR FORCE REQUIREMENTS												
5 (FIRM)	4	3	2	3	4	3	4	4	3	2	4	2
6 (PLANNING)												
7 NASA REQUIREMENTS												
8 (FIRM)								1		1		1
9 (PLANNING)												
10 ARPA REQUIREMENTS												
11 (FIRM)		1						1			1	
12 TOTAL REQUIREMENTS												
13 (FIRM)	4	4	2	3	4	3	4	6	3	3	5	3
14 (PLANNING)												
15												
16 GRAND TOTAL REQUIREMENTS	4	4	2	3	4	3	4	6	3	3	5	3
17												
18 CUMULATIVE PRODUCTION BANK												
19 (FIRM)	+11				+15							+9
20 (FIRM AND PLANNING)	+11				+15							+9

S-01A	FY-64						FY-65					
CY-64	J	F	M	A	M	J	J	A	S	O	N	D
1												
2 PRODUCTION	3	3	3	3	3	3	3	3	3	3	3	3
3												
4 AIR FORCE REQUIREMENTS												
5 (FIRM)	3	1	1	3	3	2	3	4	2		1	
6 (PLANNING)			1	1	1	1		2	2	3	2	3
7 NASA REQUIREMENTS												
8 (FIRM)	1		1	3	2		1		1		2	
9 (PLANNING)									1			
10 ARPA REQUIREMENTS												
11 (FIRM)		1			1							
12 TOTAL REQUIREMENTS												
13 (FIRM)	4	2	2	6	6	2	4	4	3	0	3	0
14 (PLANNING)			1	1	1	1		2	3	3	2	3
15												
16 GRAND TOTAL REQUIREMENTS	4	2	3	7	7	3	4	6	6	3	5	3
17												
18 CUMULATIVE PRODUCTION BANK												
19 (FIRM)							+5					+9
20 (FIRM AND PLANNING)							+1					-8

S-01A	FY-65						FY-66					
CY-65	J	F	M	A	M	J	J	A	S	O	N	D
1												
2 PRODUCTION	3	3	3	3	3	3	3	3	3	3	3	3
3												
4 AIR FORCE REQUIREMENTS												
5 (FIRM)		1										
6 (PLANNING)	1	2	2	2	1	1	2	1	0	1	2	0
7 NASA REQUIREMENTS												
8 (FIRM)	1		1		1							
9 (PLANNING)			1	1		1		1	3	2	2	2
10 ARPA REQUIREMENTS												
11 (FIRM)												
12 TOTAL REQUIREMENTS												
13 (FIRM)	1	1	1	0	1							
14 (PLANNING)	1	2	3	3	1	2	2	2	3	3	4	2
15												
16 GRAND TOTAL REQUIREMENTS	2	3	4	3	2	2	2	2	3	3	4	2
17												
18 CUMULATIVE PRODUCTION BANK												
19 (FIRM)												
20 (FIRM AND PLANNING)							-6					-4

S-01A	FY-66						FY-67					
CY-66	J	F	M	A	M	J	J	A	S	O	N	D
1												
2 PRODUCTION	3	3	3	3	3	3	3	3	3	3	3	3
3												
4 AIR FORCE REQUIREMENTS												
5 (FIRM)			(UNKNOWN)									
6 (PLANNING)		1						1				
7 NASA REQUIREMENTS												
8 (FIRM)			(UNKNOWN)									
9 (PLANNING)	1	2	2	1	1	1	1					
10 ARPA REQUIREMENTS												
11 (FIRM)			(UNKNOWN)									
12 TOTAL REQUIREMENTS												
13 (FIRM)												
14 (PLANNING)	1	3	2	1	1	1	1	1				
15												
16 GRAND TOTAL REQUIREMENTS	1	3	2	1	1	1	1	1				
17												
18 CUMULATIVE PRODUCTION BANK												
19 (FIRM)			(UNKNOWN)									
20 (FIRM AND PLANNING)												

S-01A	FY-67						FY68					
CY-67	J	F	M	A	M	J	J	A	S	O	N	D
2 PRODUCTION	3	3	3	3	3	3	3	3	3	3	3	3

S-01A	FY68											
CY-68	J	F	M	A	M	J	J	A	S	O	N	D
2 PRODUCTION	3	3	3	3	3	3						

DOWNGRADED AT 3 YEAR INTERVALS; DECLASSIFIED AFTER 12 YEARS. DOD DIR 5200.10

CLASSIFICATION CHANGED TO

By authority of

By Date

CONFIDENTIAL

AEROSPACE FORM REV 5-61
-621 - BOND
-622 - VELLUM

UNCLASSIFIED

SECTION IV

FINANCIAL REQUIREMENTS

UNCLASSIFIED

SECTION IV UNCLASSIFIED

IV. FINANCIAL

A. S-01A Vehicle

1. Funding Guidance

a. Hq USAF message (SCCBB-29-5-141), dated 29 May 1962, directing using program funding for S-01A.

b. Hq USAF directive, 25 June 1962, to prorate general support (SCTB, Reliability, storage, repair, manuals) costs to using programs.

c. Hq USAF message (AFSSV-EQ-92346), dated 22 October 1962, directing using program funding for sustaining engineering.

2. S-01A Forecast Costs

a. All costs associated with the S-01A vehicle until delivery to the using program, plus logistic support of the S-01A vehicle until launch are included in the financial estimates on the following page. These estimated S-01A funding requirements will be adjusted to reflect negotiated fixed price contracts.

b. The S-01A funding requirements in this management package provide for the following: basic vehicle, spares, optional equipment, production propellants, manuals, storage, repair and logistic support plus prorated general support costs.

c. Examples of costs not included in this package are: using program peculiar costs, first destination transportation, using program system test, and launch propellants.

B. Launch Services

1. Launch Services provides supplies and services, including launch propellants, but does not include manufacture or procurement of Space Vehicles or Aerospace Ground Equipment, components or spares.

2. The Launch Capability Contracts are entirely Satellite System Program funded. Satellite System Program Offices fund against actual costs.

3. Launch Services are contracted on a calendar year basis.

4. Vehicle DD 250 shortages and program modifications will be taken care of by Program Office and not by the Launch Services Contracts.

5. Modifications which can be completed within the normal space vehicle turn around time such as:

a. Minor equipment modifications necessary to insure mission success as caused by late Satellite System Program changes.

b. Minor complex modifications for updating and launch-to-launch program changes that can be completed with the normal vehicle turn-around time.

6. Launch schedule or rate changes are subject to CCN action.

SPACE SYSTEMS DIVISION
S-01A MANAGEMENT PACKAGE
FUND REQUIREMENTS

DESCRIPTION	MPC	FY-64	FY-65	FY-66	FY-67	FY-68
Basic Vehicle	1200	$30.6	$28.8	$27.0	$25.2	$25.2
Spares	1200	3.2	2.9	2.6	2.2	1.9
Configuration Cost (Optional Equipment)	1200	2.8	2.5	2.1	1.7	1.5
Technical Manuals	7000	.5	-	-	-	-
Logistic Support & Storage	1200	2.2	1.8	1.6	1.5	1.5
General Support	1200	3.5	3.5	3.5	3.5	3.5
Advanced Development	1200	1.0	1.0	1.0	1.0	1.0
Industrial Facilities	8000	1.0	-.0	-	1.0	-
ECP's, Prod. Propellants, Factory Test Equip., etc.	1200	2.0	1.5	1.5	1.5	1.5
SUB TOTAL		$46.8M	$42.0M	$39.3M	$37.6M	$36.1M
Launch Services		26.6	22.2	22.2	22.2	22.2
TOTAL		$73.4	$64.2	$61.5	$59.8	$58.3

"SPECIAL ACCESS REQUIRED"

Appendix No. 1.

SPACE SYSTEMS DIVISION
UNITED STATES AIR FORCE
S-01A MANAGEMENT PACKAGE

20 March 1963

SSZA-1186

PROGRAM SCHEDULE - 5 years

~~SECRET~~

As of 11 March 63

S-01A REQUIRE

50X1

	O - Planning Vehicles	FY-63						FY..64																FY-67					
	PROGRAM	CY-63																	66					C)					
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	S	O	N	D	J	F	M	A	M	J
1	369																												
2																													
3	461																												
4																													
5	[redacted]																												
6																													
7	206											1					1												
8																													
9	698BK		1			1	1	1	1		1	1	1	1		1	1	1											
10																													
11	162	2				1		1		1		1		1				1											
12																													
13	Sub Total	2	2	2	3	2	2	2	3	2	1	1	1	1	1	1	2	2											
14																													
15	823 ARPA	4	3	2	3	4	3	4	4	3	2	4	2	3	1	2	4	4	1		(UNKNOWN)								
16																													
17	NASA PROGRAMS		1						1			1			1			1											
18																													
19	NIMBUS																												
20																													
21	MARINER																												
22																													
23	OAO																1	1											
24																													
25	RANGER																	1											
26																													
27	POGO								1					1			1												
28																													
29	GEMINI											1					1												
30																													
31	Sub Total												1			1													
32																													
33	REQUIREMENTS (firm)								1		1		1	1		1	3	2			(UNKNOWN)								
34	TOTAL (Planning)	4	4	2	3	4	3	4	6	3	3	5	3	4	2	2	6	6											
35																													
36	S-01A DELIVERY															1	1	1	1										
37	SCHEDULE							3	3																				
38	PRODUCTION BANK	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3						
39	(Semi-Annual																												
40	CUM-PRODUCTION +11						+4						-6																
	BANK						+13						+9																
		J	F	M	A	M	J	J	A	S	O	N	D	J	F					S	O	N	D	J	F	M	A	M	J

AR INTERVALS:
ESSIFIED
.10

ACCESS REQUIRED
SENSITIVE AREA
01A IDENTITY

AEROSPACE FORM REV 5-61
-621 - BOND
-622 - VELLUM

ACTION SSVR 253

ZCZC [illegible] 34ZCJRC959
RR RU[illegible]
DE [illegible] 10 -162112
ZNR
R 161700Z APR
FM AFSC ANDREWS AFB MD
TO [illegible] SSD LOS ANGELES CALIF
INFO [illegible] NASA
[illegible] LEWIS RESEARCH CENTER NASA 21000 BROOKPARK RD CLEVELAND OHIO

1963 APR 16 PM 1:37

INFO SSGE

UNCLAS MSFA 16-4-35.
FOR SSG. NASA FOR MR. D. FORSYTHE, LEWIS RESEARCH CENTER FOR DR. S. C. HIMMEL. YOUR SSG 3-4-5. YOU ARE AUTHORIZED TO IMMEDIATELY PROCEED WITH ACTIONS PERTINENT TO TRANSFER OF CONTRACTS FOR PECULIAR MODIFICATIONS AND SYSTEM INTEGRATION PORTIONS OF THE NASA/AGENA LAUNCH VEHICLE EFFORT TO LEWIS RESEARCH CENTER.
BT
16/1707Z APR RUEAFF

My Ken
S/LP
file
rec'd 17 Apr 63
11897

SECRET S E C R E T

As of 11 March 63

O - Planning Vehicles

S-01A REQUIREMENTS VS DELIVERY SCHEDULE

	FY-63						FY-64					
	CY-63											
PROGRAM	J	F	M	A	M	J	J	A	S	O	N	D
369												
461												
[redacted]											1	
206		1			1	1	1	1		1	1	1
698BK	2				1		1		1		1	
162	2	2	2	3	2	2	2	3	2	1	1	1
Sub Total	4	3	2	3	4	3	4	4	3	2	4	2
823 ARPA		1						1			1	
NASA PROGRAMS												
NIMBUS												
MARINER												
OAO												
RANGER								1				
POGO											1	
GEMINI												1
Sub Total								1		1		1
REQUIREMENTS (firm)	4	4	2	3	4	3	4	6	3	3	5	3
TOTAL (Planning)												
							4	3				
S-01A DELIVERY SCHEDULE	4	4	4	4	4	4	4	4	3	3	3	3
PRODUCTION BANK (Semi-Annual)						+4						-6
CUM-PRODUCTION +11 BANK						+14						+9

	FY-64						FY-65					
	CY-64											
PROGRAM	J	F	M	A	M	J	J	A	S	O	N	D
369								1		1		1
461								1			1	
[redacted]				1								
206	1		1	1	1	1		1	1	1	[illegible]	[illegible]
698BK	1				1		1	1	1	1	1	1
162	1	1	1	2	2	2	2	2	2			
Sub Total	3	1	2	4	4	3	3	6	4	3	3	3
823 ARPA		1			1							
NASA PROGRAMS												
NIMBUS											1	
MARINER				1	1							
OAO					1							
RANGER	1			1								
POGO				1					1			
GEMINI			1				1		1		1	
Sub Total	1		1	3	2		1		2		2	
REQUIREMENTS (firm)	4	2	2	6	6	2	4	4	3	0	3	0
TOTAL (Planning)			1	1	1	1		2	3	3	2	3
S-01A DELIVERY SCHEDULE	3	3	3	3	3	3	3	3	3	3	3	3
PRODUCTION BANK (Semi-Annual)						[illegible]		-8				+4
CUM-PRODUCTION +11 BANK						+5		+1				+9

	FY-65						FY-66					
	CY-65											
PROGRAM	J	F	M	A	M	J	J	A	S	O	N	D
369		1	1	1			1	1		1	1	
461		1										
[redacted]							1				1	
206												
698BK	1	1	1	1	1	1						
162												
Sub Total	1	3	2	2	1	1	2	1		1	2	
823 ARPA												
NASA PROGRAMS												
NIMBUS				1		1			1			
MARINER										1	1	
OAO									1			1
RANGER								1	1	1	1	1
POGO			1									
GEMINI	1		1		1							
Sub Total	1		2	1	1	1		1	3	2	2	2
REQUIREMENTS (firm)	1	1	1	0	1							
TOTAL (Planning)	1	2	3	3	1	2	2	2	3	3	4	2
S-01A DELIVERY SCHEDULE	3	3	3	3	3	3	3	3	3	3	3	3
PRODUCTION BANK (Semi-Annual)	-[illegible]				-2							3
CUM-PRODUCTION +11 BANK	-3				6							-4

	FY-66						FY-67											
	CY-66												CY					
PROGRAM	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J
369																		
461		1						1										
[redacted]																		
206																		
698BK																		
162																		
Sub Total		1						1		(UNKNOW								
823 ARPA																		
NASA PROGRAMS																		
NIMBUS			1															
MARINER		1																
OAO																		
RANGER	1	1	1	1	1	1	1											
POGO																		
GEMINI																		
Sub Total	1	2	2	1	1	1	1			(UNKNOW								
REQUIREMENTS (firm)																		
TOTAL (Planning)	1	3	2	1	1	1	1	1										
S-01A DELIVERY SCHEDULE	3	3	3	3	3	3	3	3	3	3	3	3						
PRODUCTION BANK (Semi-Annual)																		
CUM-PRODUCTION +11 BANK																		

DOWNGRADED AT 12 YEAR INTERVALS
[illegible]
DOD DIR 5200.10

SPECIAL ACCESS REQUIRED
SENSITIVE
PROGRAM NO. S-[illegible] DEPT [illegible]

AEROSPACE FORM REV 5-61
-621 - BOND
-622 - VELLUM

50X1

SSVR (Capt Hayes)

HEADQUARTERS
SPACE SYSTEMS DIVISION
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
Air Force Unit Post Office, Los Angeles 45, California

9 MAY 1963

REPLY TO ATTN OF: SSV

SUBJECT: Letter of Understanding Between NASA Lewis Research Center and USAF Space Systems Division for Transfer of NASA Agena Contracts

TO: (See Distribution)

1. Tabulated below are the agreements established in the discussions between NASA Lewis Research Center (LeRC) and USAF Space Systems Division (SSD) on 8 May 1963. These discussions involved the pending transfer of Air Force contracts on the NASA Agena programs from SSD to LeRC.

a. Block of contracts with Lockheed Missiles & Space Company (LMSC) (-592, -59, L/C -291, L/C-314, POGO contract which will be -284).

(1) LeRC will assume contractual and technical direction of these contracts with a target date of 17 June 1963.

(a) Following 17 June 1963, SSD will provide to LeRC, as may be requested, normal technical and procurement/contracting support for scheduled contractual actions which occur prior to 1 July 1963, based on existing schedules. Should negotiation schedules slip, SSD will furnish on an "as available" basis such technical support for this purpose as LeRC may request.

(2) Mr. Orinovsky, the SSD Procurement Contracting Officer, will take immediate action to formally notify LMSC and the LMSC/AFPR Administrative Contracting Officer (ACO) of the following:

(a) All vouchers cleared through the ACO prior to 1 June 1963 will be presented for payment through current Air Force channels.

(b) Beginning 1 June 1963, all vouchers cleared through the ACO will be mailed to LeRC for payment action (Mr Beckett, LeRC, will provide Mr. Orinovsky with the mailing address for these vouchers).

(3) The SSD Comptroller will notify immediately the applicable Air Force paying station of the actions indicated in paragraph (2) above.

(4) The POGO contract (-284) will be negotiated and distributed by SSD prior to contractual transfer to LeRC. To support this effort LeRC will expedite transmission of a NASA funding citation to SSD to enable the SSD Comptroller to apply funds citing NASA rather than Air Force funds against the POGO contract.

b. FIRE Integration Contract (-189) with General Dynamics/Astronautics (GD/A).

(1) Dr. Himmel, LeRC, and Mr. Mahon, Hq NASA, will coordinate action to formally notify Langley Research Center (LRC) that LRC is to assume contractual and technical direction of the -189 contract.

(2) Upon receipt of information copies of correspondence relative to the actions of paragraph (1) above, SSD will coordinate with LRC to effect an expeditious transfer of the -189 contract.

c. Guidance Equations Contract (-175) with Space Technology Laboratories (STL).

(1) The supplemental agreement to the -175 contract, which involves block changes to the guidance equations, will be negotiated and definitized by SSD with LeRC contracting and technical personnel in attendance. Negotiation of this supplemental agreement is scheduled for completion prior to 1 July 1963. Contingent upon this action, LeRC will officially assume contractual and technical direction of the -175 contract, after a cut-off date has been established and appropriate time span for fiscal processing.

d. GD/A OAO Mission Peculiars covered by CCN #16 to the -240 contract.

(1) Transfer of contractual and technical direction of this effort was discussed, and the inability of SSVR to provide technical direction beyond 1 July 1963 was acknowledged. Resolution of the problems involved was postponed pending further discussions between Dr. Himmel and Col Brandeberry, SSVZ, scheduled for 9 May 1963.

ROBERT W. HOFFMAN
Colonel, USAF
Deputy for Engineering

SEYMOUR C. HIMMEL
Manager, Agena Project
Lewis Research Center

2 Atchs
1. Attendance list, LeRC/SSD Mtg, 8 May 63
2. Distribution list

ATTENDANCE LIST

LeRC/SSD Meeting on Nasa Agena Contracts Transfer

8 May 1963

NASA

J. B. Mohon	NASA Headquarters
Dr. S. C. Himmel	NASA Lewis Research Center
H. C. Moore	" " "
W. H. Beckett	" " "
P. E. Barhoover	" " "
E. E. Haden	" " "

SSD

Col R. W. Hoffman	SSV
Col L. J. Hutton	SSV
Col F. E. Brandeberry	SSVZ
Maj C. A. Wurster	SSVR
Maj W. H. Wert	SSZN
Maj W. D. Hepler	SSCA
Maj R. D. Kerr	SSVR
Maj E. F. W. Eisemann	SSVZ
Sq Ldr A. Pickering	SSVR
Capt B. J. Landers	SSCA
Capt A. L. Hayes	SSVR
1 Lt. J. F. Kemp	SSCB
Mr. B. S. Silberman	SSZ
Mr. J. H. Bender	SSJ
Muriel Gaughan	SSCA
Mr. S. Lovas	SSK
Mr. R. H. Simon	SSVZ
Mr. L. Orinovsky	SSZN

DISTRIBUTION LIST

Each Attendee	1 cy
AFSC (DCMSF)	2 cys
AFPR/LMSC	1 cy
AFPR/GD/A	1 cy
SSD/NASA Tech Rep (Mr. Kindt)	1 cy
NASA/LMSC (Mr. Forney)	1 cy

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JUN 19 1963

SSZAC/Capt Quinn/RAD 4063

Configuration Control Management of Program S-01A Booster Vehicles

SSZN
SP-206

1. References:

a. Memorandum of Agreement between SSH, SSZN, SSZX and SSZT, Subj: Management Relationships Between SSH - SSZT, SSZN, SSZX and LMSC, dated 5 Sep 62.

b. Letter to SSZN and SSZX from SSH, Subj: Configuration Control of Program/Agena D Booster Vehicles, dated 9 Jan 63.

c. Confidential letter to LMSC from SSZ (Info: SSZN and SP-206), Subj: Configuration Control Management of Program S-01A Booster Vehicles, dated 23 Jan 63.

d. Letter to SSD from LMSC, Subj: Contract AF 04(695)-92 Configuration Control Management, LMSC/A066438, dated 26 Mar 63.

e. Letter to SSD from LMSC, Subj: Contract AF 04(695)-102 Configuration Control Management, LMSC/A066439, dated 26 Mar 63.

2. Various changes in organizational responsibilities which have occurred since the Memorandum of Agreement (Ref 1a) dictate a reappraisal of the configuration management agreement of Paragraph 7 (Ref 1a) and the guidelines further delineated in Ref 1b. Since both the AF Contracts 04(695)-92 and -102 are no longer administered by the S-01A Directorate but rather by contracting officers directly supporting the 623 and 206 Program Offices, the responsibilities of our respective offices have substantially changed from those called out in Ref 1b.

a. The original plan for processing Program/S-01A Vehicle Engineering Change Proposals (ECP's) was essentially as follows: The LMSC Booster Program Office would initiate ECP's and process them through the LMSC S-01A Office which would in turn forward them to the USAF S-01A Directorate (SSZA). We would review the ECP's for compliance with format directives and forward them to the USAF Program Offices concerned (SSZN and SP-206) for your engineering review and Configuration Control Board (CCB) action. You would then send SSZA a Configuration Control Board Directive (CCBD) for each ECP indicating approval or disapproval, and the SSZA contracting officer would issue either a Contract Change Notice (CCN) author-

SSZAC/Capt Quinn/jl/18 Jun 63

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DOWNGRADED AT 3 YEAR INTERVALS;
DECLASSIFIED AFTER 12 YEARS.
DOD DIR 5200.10

~~CONFIDENTIAL~~

ining the change or a letter to LMSC reflecting disapproval of the proposal and the reason therefor. The LMSC S-01A Office would then process any approved change and would authorize the LMSC Booster Program Office to proceed with the change. At the same time, the LMSC S-01A Office would reflect the change in the Configuration Identification Index and Status Reports for the booster program concerned. These reports would be forwarded from the LMSC S-01A Office to SSZA for subsequent distribution to SSZH and SP-206.

b. However, since the 623 and the 206 Program Offices now have both the CCB and the contracts administration function, the inclusion of the S-01A Directorate in this cycle appears of dubious value and might even be a detriment to the expeditious processing of the change proposals and the distribution of reports.

c. We therefore feel that it would be of advantage to our respective offices that SSZA's configuration management responsibilities to the Program Offices be amended to the following:

(1) Assist and advise SSZH and SP-206 as called upon in establishment of their program's configuration management functions.

(2) Review and coordinate Program/S-01A vehicle and associated equipment (including AGE) specifications.

(3) Perform First Article Configuration Inspection (FACI) and establish the baseline for the program booster when so requested by the Program Office.

d. The Program Offices' amended responsibilities are as follows:

(1) Submit Program/S-01A booster vehicle specifications to SSZA for review and coordination.

(2) Establish a Configuration Management Office (CMO) and/or Configuration Control Board (CCB) to accomplish management control functions.

(3) If SSZA is to perform FACI for the Program Office, notify SSZA of the estimated date of delivery of the First Program/S-01A Vehicle so a date for FACI may be established and provide members for the FACI team, notifying SSZA of those designated sufficiently prior to FACI so necessary team coordination may be accomplished.

(4) Receive, process and act upon ECP's relating to the Program/S-01A equipment.

(5) Process promptly, ECP's, forwarding them to the contracting officer concerned for issuance of CCN's or other contractual directives.

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to execute the CCBD.

(6) Forward courtesy copies of all ECP's and CCBD's to SSZA for information only.

(7) Call on SSZA as required for aid or advice on configuration management and control functions.

3. Although there is no longer a requirement for SSZA to be in the ECP processing cycle of SSZE and SP-206, the LMSC S-01A Office will still handle the configuration management and control functions for the S-01A Vehicle and the Booster Program Vehicles and should have uniform procedures in dealing with each. We therefore recommend that the implementing instructions to LMSC for the Booster Programs be patterned after those for the S-01A Offices. A copy of the implementing instructions presently being negotiated for the S-01A Office is attached for your information.

4. In response to an LMSC letter from Mr. R. R. Kearton to General Robert E. Greer (LMSC/A303591, late 1962), SSZ explained the configuration control management relationships planned for the S-01A Directorate and the Program Offices and requested LMSC to submit cost proposals to incorporate changes in the -92 and -102 contracts to contractually cover LMSC's configuration control activities. (Ref 1c) The contractor subsequently submitted proposals (Ref's 1d and 1e) which were not completely acceptable to the Air Force, and further meetings were held to reach agreement on the proposed work statement changes. Since the -92 and -102 contracts are now administered by your contracting officers rather than SSZA's, action must be initiated by your office to incorporate the work statement changes into your contract if you plan to initiate or continue configuration management control procedures. Should you decide to do so, a copy of the recommended work statement change for your program office is attached.

SIGNED
/s/ Robert K. LeLeck, Lt. Col, USAF
EDWARD F. DIEM
for Colonel, USAF
Director, SS-01A Space Project

2 Atch
1. S-01A Implementing Instructions
2. Recommended Work Statement Change

~~CONFIDENTIAL~~

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FM HQ USAF WASH DC
TO RUE AFF/AFSC ANDREWS AFB MD
INFO RUEAFF/AFSC (SCSB) (COLONEL CRISTRADORO) ANDREWS AFB MD
RUWHBK/SSD (SSZA (LT COLONEL LEBECK) LOS ANGELES CALIF
RUWHBF/ROCKET PROPULSION LAB (DGGD) EDWARDS AFB CALIF
AF GRNC
NT
UNCLAS FROM AFRSTD 76993

SUBJECT: HYBALINE PROGRAM. REFERENCE OUR MESSAGE 75215, 1 JULY 1963, SAME SUBJECT. UNDER SECRETARY MCMILLAN HAS CLARIFIED HIS REQUEST FOR INFORMATION ON THE HYBALINE PROGRAM. HE WOULD LIKE A PRELIMINARY DEVELOPMENT PLAN PUT TOGETHER FOR A HYBALINE FUELED AGENA WHICH INDICATES THE QUANTITIES AND TIME PHASING OF HYBALINE REQUIRED. HE HAS STATED THAT THIS PLANNING DOES NOT NECESSARILY INDICATE THAT WE WILL PROCEED WITH AN ENGINE DEVELOPMENT PROGRAM EVEN IF THE PRESENT BELL EFFORT IS SUCCESSFUL. DR. MCMILLAN HAS ASKED FOR A BRIEFING ON THE PRELIMINARY DEVELOPMENT PLAN AROUND THE END OF JULY. PLEASE CONFIRM DATE THIS BRIEFING WILL BE AVAILABLE.

P 1520457 Jul 63
FM DCMSF ANDREWS AFB MD
TO RUWHBK/SSD LOS ANGELES CALIF
RUEABL/RTD BOLLING AFB WASH DC
INFO RUWHBF/ROCKET PROPULSION LABORATORY EDWARDS AFB CALIF
BI
UNCLAS MSFA 15-7-22

FOR SSV (COL BLUM). RTD FOR RTNP; RPL FOR DGGD. THIS CONFIRMS 12 JULY 1963 TELECON BETWEEN COL BLUM (SSV) AND MSFAM PERSONNEL. REQUEST SSD COMPLY WITH USAF MESSAGE AFRSTD 76993. FURTHER REQUEST RTD ASSIST SSD IN PREPARATION AND PRESENTATION OF THE REQUIRED PLAN. THIS OFFICE UNDERSTANDS THE BRIEFING WILL BE AVAILABLE WEEK OF 29 JULY. WE WILL NOTIFY HQ USAF ACCORDINGLY AND ADVISE OF PRESENTATION SCHEDULE AS SOON AS IT IS FIRM.

13-1, Sec 13, AFSC (USAF) Preliminary
Development Plan for Hybaline-Fueled
Agena Space Vehicle, System No.
[illegible] 63

HEADQUARTERS
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
ANDREWS AIR FORCE BASE
WASHINGTON 25, D. C.

RP

257

REPLY TO ATTN OF: MSFAR

20 AUG 1963

SUBJECT: Transmittal of Memorandum of Agreement

TO:		
SSD (SSG) (2)	6555ATW (5)	AFMTC (4)
SSD (SSO) (5)	6595ATW (2)	WCMR (RWG) (2)
SSD (SSV) (5)		

1. Forwarded herewith are copies of the USAF-NASA Memorandum of Agreement, NASA Office of Space Sciences, Agena Launch Vehicle Program, dated 9 August 1963.

2. Your particular attention is invited to Section V which requires that this agreement be implemented in an orderly and expeditious manner. It is requested that any problems involved in carrying out the provisions of this agreement be brought to the attention of this Headquarters.

FOR THE COMMANDER

Rodney Nudenberg

RODNEY NUDENBERG
Colonel, USAF
Assistant Deputy to the Commander
Manned Space Flight

1 Atch
a/s

9 AUG 1963

USAF-NASA MEMORANDUM OF AGREEMENT
NASA OFFICE OF SPACE SCIENCES
AGENA LAUNCH VEHICLE PROGRAM

I. Purpose: The purpose of this agreement is to define interface areas and delineate responsibilities between NASA and USAF pertaining to those NASA (OSS) programs using the Atlas, Atlas/Agena and Thor/Agena launch vehicles. This document supersedes the 14 February 1961 Schriever-Seamans Agreement "NASA Agena B Launch Vehicle Program Management and Organization". This agreement specifically excludes those launch vehicle efforts covered by separate agreement between the USAF and NASA (MSC).

II. Definitions: See Attachment 1 for standard nomenclature for launch vehicles and stages.

III. General:

A. USAF (AFSC) has assigned to the Space Systems Division (SSD) development, procurement and delivery of space boosters and stages. Launch responsibility for the DOD missions has been delegated to the 6555th Aerospace Test Wing at AMR and the 6595th Aerospace Test Wing at PMR.

B. NASA has assigned vehicle systems management of the launch vehicle portions of NASA programs using Atlas, Atlas/Agena and Thor/Agena to the Lewis Research Center (LeRC). NASA launch responsibility for these vehicles has been delegated to the Field Projects Branch of the Goddard Space Flight Center at both AMR and PMR. For these functions, the Field Projects Branch is under the technical direction of the LeRC.

C. Direct negotiation on the aforementioned vehicle programs will be conducted by these USAF and NASA organizations at the appropriate level.

IV. Policies and Procedures:

A. Development and Production of Launch Vehicles and Stages

1. USAF will have responsibility for design, engineering and acceptance testing of basic Atlas and Thor vehicles and Agena D stages. Standard vehicles and stages will not be identified for NASA or USAF assignment prior to DD-250 acceptance. Standardized optional equipment

for the basic vehicle stages is considered as part of the standard vehicle or stage and is designated by the user as required to fulfill specific missions.

2. NASA will have membership on the Configuration Control Boards (CCB) for launch vehicles and stages.

3. A coordination group shall be established for each launch vehicle and/or stage. This group shall consist of the NASA Project Manager and the appropriate USAF vehicle or stage project officer or their agents. This coordination group will afford NASA opportunity to review, on a current basis, all design features of the vehicles, stages and their components and proposed changes thereto, quality control procedures, reliability, test procedures, performance capability, etc., pertinent to the flight performance and mission objectives of these vehicles. A memorandum of understanding shall be prepared providing for the functions and procedures of this group.

4. NASA and USAF will provide to each other available bibliographies of technical reports and documents for the launch vehicles and stages, systems and subsystems. Documentation selected from these bibliographies will be exchanged as requested.

5. NASA may visit the stage and vehicle portions of the prime and associate contractor's plants for the purposes of witnessing systems, subsystems and integrated systems tests, observing factory operation and having technical discussions with contractor technical personnel, etc. Such visits shall be coordinated with the appropriate USAF launch vehicle project director's office and the contract management region resident representative's office. NASA personnel shall not directly or by implication provide technical direction to these contractors relative to USAF contracts.

6. NASA personnel, after suitable arrangements with the appropriate USAF offices, may participate on the development team(s) for the standard Atlas vehicles.

B. Procurement of Standard Launch Vehicles and Stages: NASA will procure from the USAF the Atlas, Thor and Agena D stages. Costs will be paid by NASA according to the established vehicle costs as well as a proration of any costs incurred due to NASA reprogramming or additional development requirements. NASA will furnish timely written requirements and schedules directly to the appropriate launch vehicle office at SSD for procurement. SSD will inform NASA of funding requirements to support requested procurement.

C. Mission Adaptation and Flight Planning

1. NASA will assume responsibility for the remaining Agena B's in the NASA programs and for System Test Complexes C-7 and C-13.

2. Subsequent to receiving basic stages and boosters after DD-250 acceptance, NASA will be responsible for all booster and stage modification, spacecraft installation, and systems integration, which may be accomplished by direct NASA contract. These responsibilities will include, but not be limited to, flight test documentation, design and fabrication of Aerospace Ground Equipment (AGE) for both NASA in-plant and launch base operations, performance analysis, trajectory computation and mechanization of Atlas ascent equations.

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3. For those current and future USAF contracts in which NASA participates, the USAF will include provisions so that NASA integration services contractor(s), in the performance of their integration services functions, will receive information, cooperation, and participation from the USAF contractors. Costs incurred by USAF contractors in providing these services will be reimbursable by NASA.

4. If it is considered to be in the best interest of the government and mutually satisfactory to the cognizant organizations, NASA will enter into direct contracts for launch services and for AGE installation required on Complex 12 or mission peculiar AGE in Hangar E. In order to protect interests of the government, NASA will coordinate with the USAF organization having similar responsibility in USAF programs to assure consistency and efficiency.

D. Launch Operations

1. NASA will be responsible for launch operations on all NASA programs from Complex 12 AMR. This will include complete responsibility for Complex 12 AGE required to accomplish their missions. Interchange of information will be effected to maintain, insofar as practicable, consistent and compatible test plans, test procedures and equipment between NASA controlled Complex 12 and USAF controlled Complexes 13 and 14. Necessary documentation will be maintained by USAF and NASA to reflect the current configuration of assigned launch complexes.

2. Should either NASA or the USAF have occasion to use a launch complex controlled by the other agency, the user shall have the option of using its own launch crew. The agency responsible for the launch complex shall be afforded sufficient participation to protect the integrity of the complex.

3. For "common usage" equipment and facilities now in being at AMR such as Atlas Hangars, Agena Hangar E, GE guidance ground station and Burroughs computer, the USAF will retain the basic contracts, facility assignment, and technical control and direction; however, during tests on NASA vehicles or during NASA pre-launch or launch operations, NASA will have access and operational control for NASA activities. NASA will be responsible for accepting or rejecting all tests supporting their operations. Scheduling conflicts regarding use of personnel and facilities will be resolved locally by the USAF and NASA. Costs incurred by NASA on these contracts will be reimbursable to the USAF.

4. USAF will be responsible for launch operations at PMR for vehicles and stages covered under this agreement. NASA will provide its requirements for the preparation and launch of NASA vehicles at PMR to the USAF 6595th Aerospace Test Wing who will supervise the participating contractors. For NASA missions launched from PMR, NASA shall provide the 6595th ATW all required technical data pertaining to the vehicle system.

E. Coordination

1. USAF and NASA will maintain liaison in order to exchange technical information concerning related NASA and USAF programs and vehicles.

2. To insure effective utilization of facilities, spare parts supply, etc. used jointly, NASA and USAF will coordinate requirements.

3. By mutual agreement technical group memberships may be interchanged.

4. To protect interests of the government, a concerted effort will be made to restrict any unnecessary expansion of the contractors' organizations which would result in cost increases, duplication of facilities, or internal competition for highly qualified employees.

F. AFPR Support: The USAF will make available and NASA shall utilize, the capabilities and services of the AFPR.

G. Transportation: NASA will arrange with appropriate USAF authorities for transportation of launch vehicles and stages.

V. Implementation: Implementation of this agreement will be accomplished in an orderly and expeditious manner. The USAF will continue to provide support and technical advice during the period of transition.

73/

Approved:

Howell M. Estes, Jr.
HOWELL M. ESTES, JR.
Lieutenant General, USAF
Vice Commander
Air Force Systems Command

Approved:

Robert C. Seamans, Jr.
ROBERT C. SEAMANS, JR.
Associate Administrator
National Aeronautics and Space Administration

LAUNCH VEHICLES
(LV)
STANDARD LAUNCH VEHICLES
(SLV)

LV-1 Generic, Scout

LV-1A - Aerojet Senior (ALGOL II) (First Stage Only)
SLV-1A - LV-1A/02A/B/C - NASA/DOD Scout (Guided)
SLV-1B - S-02A/B/D/E - Blue Scout Jr. (Unguided)
LV-1B - S-02A/B/C - Blue Scout Jr. (Modified)

LV-2 Generic, Thor

SLV-2 - Standard Launch Vehicle, Thor
LV-2A - Thor, thrust augmented (TAT)
LV-2B - Thor, Blk I, 150K engine
LV-2C - Thor, Blk I, 150K engine, ASSET mods

LV-3 Generic, Atlas

SLV-3 - Standard Launch Vehicle, Atlas
LV-3A - Atlas D
LV-3B - Mercury Atlas
LV-3C - Centaur Atlas

LV-4 Generic, Titan II

LV-4A - Gemini Launch Vehicle, Titan II

LV-5 Generic, Titan III

SLV-5A - Standard Launch Vehicle Titan III core & transtage
SLV-5B - (Reserved for future use)
SLV-5C - Standard Launch Vehicle Titan II core & transtage and 2 solids
SLV-5D - (Reserved for future use)

Attachment 1

STAGES
(S)
STANDARD STAGES
(SS)

S-01 - Generic, Agena

SS-01A - Standard Stage, Agena D
S-01B - Agena D (Performance Improvement Program)
S-01C - Agena D - Gemini Target

S-02 - Generic, Scout

S-02A - XM-33 (CASTOR)
S-02B - ABL-254 or 259 (ANTARES I or II)
S-02C - ABL-248 or 258 (ALTAIR I or II)
S-02D - AJ10-41 (ALCOR)
S-02E - XM-85 NOTS (CETUS)

S-03 - Generic, Able Star

SS-03 - AJ10-104

S-04 - Generic, Delta

S-04A - AJ-10-101
S-04B - AJ-10-118
S-04C - ASSET

Note: The following definitions apply:

Standard Launch Vehicle (SLV) - A first stage vehicle used in DOD space programs which is produced to a definite set of specifications established to insure maximum vehicle reliability and interchangeability. Modifications will only be made to improve reliability and will be introduced as block changes to the production line. Only these vehicles will be designated as STANDARD LAUNCH VEHICLES (SLV).

Launch Vehicle (LV) - A launch vehicle developed and produced for a special limited use or an SLV modified to meet specific mission requirements and accomplished through a modification line separate from that which produces the SLV.

Standard Stage (SS) - An intermediate vehicle, not designed as a part of the first stage launch vehicle that provides thrust for ascent and orbit injection. The SS is produced to a definite set of specifications established to insure maximum reliability and interchangeability. Modifications will only be made to improve reliability and will be introduced as block changes to the production line. Only these stages will be designated as STANDARD STAGES (SS).

Stage (S) - A stage developed and produced for a special limited use or an SS modified to meet specific mission requirements and accomplished through a modification line separate from that which produces the SS.

~~CONFIDENTIAL~~

S-01 A
Agena 258

HEADQUARTERS
SPACE SYSTEMS DIVISION
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
Air Force Unit Post Office, Los Angeles 45, California

SEP 27 1963

REPLY TO ATTN OF: SSVA

SUBJECT: Annual Report of Achievements (3 Oct 1962 - 3 Oct 1963)

TO: SSV

OK

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1. During this reporting period, thirty-one (31) Agena vehicles were launched, twenty (20) of which were Agena D's. To date a total of twenty-four (24) Agena D's have been launched. Twenty-one of these have successfully been injected into orbit and one had no chance due to booster failure. On the 12th of July 1963, the 100th Agena space vehicle was launched. ~~(C)~~

2. In April 1963, approval was received for development of the S-01B, an advanced version of the Agena Space Vehicle, having additional basic performance capabilities. This program is nearing completion and the first production vehicle of the series will be delivered in early December 1963. (U)

3. Design and development of the YLR81-BA-13 multi-start rocket engine and the Bell Model 8250 Secondary Propulsion System for the Gemini Agena target vehicle, which started in the summer of 1962, are nearing successful completion. These developments will provide unprecedented flexibility for maneuverability in space. (U)

4. From March to August of 1963, a study was conducted to demonstrate the feasibility of converting the Agena rocket engine for use with Hybaline A5 fuel instead of UDMH. This study consisted of full scale tests of engine thrust chamber and gas generator as well as more basic tests to determine the physical characteristics of the fuel. Preliminary design studies based on results of these feasibility tests show that substantial performance gains can be achieved with minimum impact on both airborne and ground interfaces. There is considerable high-level interest in this program and the Under Secretary of the Air Force, Dr. McMillan, requested that a preliminary development plan be prepared and presented to him in July 1963. The briefing was favorably received and Dr. McMillan directed that a small-scale effort be continued on the development of a gas generator suitable for use with Hybaline and that this program be scheduled for presentation to the Launch Vehicle Panel. It is expected that this presentation will occur in early October 1963. (U)

DOWNGRADED AT 3 YEAR INTERVALS;
DECLASSIFIED AFTER 12 YEARS.
DOD DIR 5200.10

~~CONFIDENTIAL~~

5. During the past year the Aerospace Ground Equipment Division has completed the following launch complex activations in support of Air Force and ARPA space programs. Each of these activations was completed in a timely manner to support the scheduled space missions.

a. Activation of Point Arguello Launch Complex No. 2 for the S-01A portion of the SAFSP 206 Program was completed under LMSC Contract AF 04(695)-131 on 31 May 1963 at a cost of $15,301,706. A Vehicle on Stand capability was attained on Pad 3 on 15 February 1963 and on Pad 4 on 7 May 1963. (U)

b. AMR Complex 13 was converted from an Atlas E configuration to an ARPA SLV-3/S-01A/Program 823 configuration under LMSC Contract AF 04(695)-135. A Vehicle on Stand capability for the Program 823 S-01A vehicle was attained on 20 June 1963. Total cost of this project for the 823/S-01A phase was $4,406,814. ~~(C)~~

c. PALC-1, Pad 1 was converted from a SLV-3/S-01A/Program 461 configuration to an SLV-2A/S-01A/Program 162 configuration. Under the terms of LMSC Contract AF 04(695)-354, this configuration was completed and the VOS capability attained for the S-01A vehicle on 27 September 1963. ~~(C)~~

Edward F Blum
EDWARD F. BLUM
Colonel, USAF
Director, S-01A Space Project

NEWS RELEASE
PLEASE NOTE DATE

DEPARTMENT OF DEFENSE
OFFICE OF PUBLIC AFFAIRS
Washington 25, D. C.

269

NO. 1396-63
OXford 5-3201 (Info.)
OXford 7-3189 (Copies)

IMMEDIATE RELEASE October 21, 1963

DOD ANNOUNCES ORBITING OF NUCLEAR TEST DETECTION SATELLITES

The Advanced Research Projects Agency (ARPA) of the Office of the Secretary of Defense announced today that two identical experimental nuclear detection satellites are now in orbit, having been placed from a single launch. These research and development satellites will provide data on the operation of nuclear test detection sensors in space and necessary information on the natural radiation environment in which the sensors must function.

This satellite program was a joint AEC/DOD effort under the over-all supervision of the Nuclear Test Detection Office of the Defense Department's Advanced Research Projects Agency. The spacecraft were designed, fabricated, and tested by a team of scientists and engineers from the Los Alamos Scientific Laboratory, Sandia Corporation, Space Technology Laboratory, and Aerospace Corporation. Detailed technical supervision was provided by an AEC/AF Joint Technical Group under the leadership of the Air Force Space Systems Division, Air Force Systems Command. The launch operation was conducted by the Air Force.

The program for satellite detection began in 1959 when the Los Alamos Scientific Laboratory began studying the problems associated with the detection and identification of nuclear detonations in space. Since then, the effort has progressed through a series of ARPA sponsored "hitch-hiker" flights on other vehicles to this recent full-scale launch.

Each nuclear detection spacecraft is five feet in diameter and weighs about 500 pounds. The spacecraft is a regular polyhedron with twenty triangular surfaces. The triangular surfaces are covered with solar cells for conversion of radiant energy from the sun into power for the operation of the spacecraft. A central cylinder houses the orbit injection rocket, and provides structural rigidity and strength.

Much of the radiated energy from a nuclear blast is in the form of a pulse of X-rays less than a millionth of a second long. Because of nuclear processes, gamma-rays and neutrons are also radiated. The recently launched spacecraft contain instruments designed to detect all of these types of radiation. They will also provide data on the natural background.

The X-ray detectors are the box-like structures at the corners of the spacecraft. The neutron and gamma radiation detectors are located inside the satellite. Inclusion of three types of detectors should make it [illegible] radiations. With such sensors it is believed to be possible to detect nuclear tests conducted in space more than ten million miles from the earth.

The two spacecrafts in tandem are jettisoned after providing protection for the spacecraft during the early portion of the flight up through the atmosphere. The saucer-shaped cover over each spacecraft provides protection during injection into orbit, after which it also is jettisoned.

The selection of an orbit was influenced by previous space radiation measurements from other satellites and space probes. An almost circular far-earth orbit was selected to place the spacecraft beyond the trapped particles in the Van Allen Belts.

The two spacecraft were first boosted into a highly ellipitical orbit. After coasting to the maximum orbit altitude (apogee), the first spacecraft was injected into its final circular orbit by firing its injection rocket. The second spacecraft continued around the earth to its second apogee before orbital injection, thus providing a large separation in space between the two satellites.

We expect simultaneous operation of the radiation sensors aboard the two spacecraft (nearly one hundred thousand miles apart) to insure that a cosmic ray collision with one spacecraft will not give a false alarm, because the absence of a simultaneous signal in the other spacecraft would serve as a check.

The information to be obtained from these two satellites will be used to design improved world-wide nuclear test detection systems of the future. In addition, they will provide general radiation data which will be of great value to other U.S. space programs.

END

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UNCLAS MSFA 7-11-6. SSD FOR SSVAT.
REQUEST YOUPREPARE SUMMARY OF SSD ACTIVITIES
ACCOMPLISHED ON THOSE AGENA PROGRAMS RECENTLY
TRANSFERRED TO NASA/LE WIS, INCLUDINGSTATEMENT OF
TERMINATION ACTIONS PENDING ON YOUR PART. NO SPECIAL
FORMAT REQUIREMENTS. LEZTER REPORT ACCEPTABLE.
PREFER ALL ACTIVITIES RELATED TO ONE PROJEC T BE
SUMMARIZED UNDER THAT PROJECT HEADING WITH SEPARATE
GENERAL AREA IF NECESSARY. SUMMARY DESIRED THIS
HQ (MSFAN) NOT LATER THAN 2DEC 1963.
BT

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extended to end of month

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SUMMARY REPORT

Transfer of NASA Agena Programs
from AFSSD to NASA LeRC

This is a final SSD program office close-out report summarizing the Air Force responsibilities for program peculiar modification and system integration on ten NASA Agena vehicle programs which were transferred from Hq Space Systems Division to NASA Lewis Research Center (LeRC) during 1963. This report does not cover the remaining SSD responsibilities on these programs (procurement of boosters, stages, spares and launch operation services) which are still under Air Force contracts, funded directly by LeRC and directed by other SSD offices.

31 December 1963

Gemini Agena Division
S-01A Space Project Directorate
Deputy for Engineering
Headquarters Space Systems Division
Los Angeles, California

A-4

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SUMMARY REPORT

Transfer of NASA Agena Programs from AFSSD to NASA LeRC

1. NASA AGENA PROGRAMS - MANAGEMENT HISTORY

a. The Ranger program (the first NASA program to use the Air Force Agena) was established under NASA Order No. S4601-G, dated 23 March 1960. In April 1960, the NASA Agena B Directorate (WDZJA) was established under the AFBMD Deputy Commander for Space Programs and was assigned the Air Force responsibilities for Ranger, although a final AF/NASA agreement concerning those responsibilities had not yet been reached. In June 1960, the program office title was changed to NASA Agena B Division (WDZJA).

b. The Schriever-Seamans' agreement, "NASA Agena B Launch Vehicle Program Management and Organization," was signed on 14 February 1961. Under this agreement, NASA had overall program responsibility and the specific responsibility and authority for accomplishment of the launch vehicle program was assigned to AFSSD. The program office title under the newly formed SSD Deputy for Engineering was the Director of Ranger (SSVR) effective in April 1961.

c. In March 1962, the program office was redesignated the Program Integration Division (SSVZR) within the SLV III Directorate and the NASA Agena B Program was revised and expanded to 38 vehicles including additional Ranger lunar vehicles, the Mariner Venus program, the Nimbus satellites, the Eccentric Geophysical Observatories (EGO), the ECHO and Rebound passive communication satellites, the Canadian S-27 program, the Polar Orbiting Geophysical Observatories (POGO), the Orbiting Astronomical Observatory (OAO), the FIRE program and Gemini rendezvous target vehicles.

d. In December 1962, the program office was redesignated the Unmanned Spacecraft Directorate (SSVR) and the NASA Agena program missions were expanded to a total of 41 vehicles.

e. During January 1963, a realignment of responsibilities occurred within NASA resulting in a transfer of the launch vehicle program from NASA Marshall Space Flight Center to NASA Lewis Research Center. Also during the first quarter the USAF and NASA reviewed their basic support agreement covering these programs. This review resulted in the decision to transfer the peculiar modification and system integration contracts from SSD to NASA LeRC, with the exception of the Gemini Agena Target Vehicle program which would remain at SSD under the overall program management of NASA Manned Spacecraft Center. Final authority to transfer non-Gemini peculiar modification and system integration contracts from SSD to NASA, so that the Air Force would procure only basic boosters and standard second stages for NASA, was requested in a message from MajGen Funk to MajGen Ritland on 3 April 1963. This request was confirmed by AFSC message to MajGen Funk on 16 April 1963.

f. By mid-July 1963, six of the eight Air Force contracts effected had been transferred to NASA and the SSD program office was transferred from the Deputy of Engineering to the Assistant for NASA Programs and was designated the Gemini Agena Directorate, SSMR.

g. On 9 August 1963, the "USAF-NASA Memorandum of Agreement NASA Office of Space Sciences Agena Launch Vehicle Program" superseded the 1961 Schriever-Seamans' agreement and confirmed the transfer of systems management responsibilities to NASA LeRC.

h. By September 1963 only one contract remained to be transferred and the SSD program office was redesignated the Gemini Agena Division, SSVAT, under the S-01A Space Project Directorate, Deputy for Engineering.

i. On 20 December 1963, the SSD program office relinquished technical cognizance of the one remaining non-Gemini contract. An earlier AF/NASA agreement had been made to maintain it as an Air Force contract under technical monitoring by NASA LeRC.

2. NASA AGENA PROGRAMS - CONTRACTS SUMMARY

Former USAF Contract Number	Current NASA Contract Number	Contractor	Value (Millions of $s)	Scope	Ranger	Mariner R	Mariner C	EGO	POGO	FIRE	OAO	Nimbus	A-12	S-27	Effective Date of Transfer
AF 04(647)-592	NAS 3-3800	LMSC	88.0	Systems Integration, Peculiar Modifications, Agena B Vehicles, Shrouds, Adapters.	x	x		x	x			x	x	x	14 June 1963
AF 04(647)-59	NAS 3-3801	LMSC	4.6	Systems Integration, Peculiar Modifications to Agena D.							x				14 June 1963
AF 04(695)-291	NAS 3-3802	LMSC	7.0	Systems Integration, Peculiar Mod. to Agena D, Adapters, Shrouds, AGE (R&D capability Pad 12, Mariner-C capability Pads 12&13, D modifications for System Test Complex 13.			x								14 June 1963
AF 04(695)-314	NAS 3-3804	LMSC	10.0	Systems Integration, Peculiar Mod. to Agena D, Adapters, Shrouds.	x										14 June 1963
AF 04(695)-284	NAS 3-3803	LMSC	2.7	Systems Integration, Peculiar Mod. to Agena D, Shrouds.					x						1 July 1963
AF 04(695)-189	NAS 1-3122 (Transferred to NASA Langley Research Center)	GD/A	1.2	Systems Integration, Ascent Guidance Mechanization.						x					10 July 1963
AF 04(694)-240 (CCN #16 negotiated on 10 Sep 63 as two new contracts: AF 04 (695)-458 and AF 04(695)-453	Unknown (These contracts had not been distributed at time SSD was relieved of mission responsibilities).	GD/A	1.66 (-458 contract) 4.43 (-453 contract)	Peculiar Hardware and Test.							x				15 Sep 1963
AF 04(695)-175 (Current)	None (Retained as AF contract under NASA technical cognizance).	STL	0.95	Guidance equations for the GE-Burroughs radio guidance system.	x	x		x			x				20 Dec 1963 (Technical cognizance only).

3. PROGRAM SUMMARY - RANGER

a. PROGRAM MISSION AND OBJECTIVES. The Ranger program objectives are to demonstrate the technology of delivering scientific equipment from Earth to the Moon and to produce scientific and environmental data in support of the United States Manned Lunar Flight program.

(1) Three series of launches were originally planned using the Atlas/Agena B launch vehicle:

(a) Block I: (2 launches) System tests for engineering development of the Ranger vehicle and ground systems.

(b) Block II:(3 launches) Moon impact with the same four experiments carried on each mission; a vidicon camera, a gamma-ray detector, a radar altimeter to obtain reflectivity data, and a seismometer. The seismometer and its radio transmitter were designed to withstand 3,000 g deceleration on impact, then to measure and transmit lunar seismic activity.

(c) Block III:(4 launches) Moon impact to acquire knowledge of lunar topography sufficient to determine gross effects on lunar landing vehicles.

(2) In late 1962, NASA added an additional series of launches using an Atlas/Agena D combination:

(a) Block IV: (5 launches) Moon impact planned as an extension of the Block III objectives by using high resolution T.V. cameras to give better definition of the lunar surface.

b. PROGRAM FUNDING. Initial funding for the NASA Agena B Programs (which included Ranger and Mariner R) was received on 23 March 1960 on NASA Order No. S-4601-G in the amount of $1,100,000. The total funding received on this order was $73,723, 313 at the time of transfer to NASA LeRC.

(1) $100,000 from NASA Order H-49600 was used to start the Block IV program. An additional $700,000 for this program was received prior to contract transfer.

c. CONTRACTUAL INFORMATION. A Cost Plus Fixed Fee contract, AF 04(647)-592, was let with Lockheed Missiles & Space Company (LMSC) on 17 April 1960, which covered the Ranger, Mariner R, Nimbus, A-12 and S-27 programs. A Letter Contract, AF 04(695)-314, was signed by LMSC on 1 May 1963 to cover the Block IV program. Both contracts were transferred to NASA LeRC on 14 June 1963.

d. SIGNIFICANT EVENTS

(1) Block I vehicles:

(a) RA-1 was launched from AMR Pad 12 on 23 August 1961. The Agena engine malfunctioned during the second burn start sequence causing the Ranger spacecraft to be separated and placed in a near-earth orbit. Commands were sent to the spacecraft and all experiments were confirmed to be functioning.

(b) RA-2 was launched from AMR Pad 12 on 18 November 1961. The Agena roll gyro was inoperative at lift-off and second burn was not achieved because of the resulting vehicle instability. Separation of the spacecraft was achieved resulting in a near-earth orbit.

(2) Block II vehicles:

(a) RA-3 was launched from AMR Pad 12 on 26 January 1962. Forty-nine seconds after lift-off, lock between the Atlas pulse beacon and the ground guidance station was lost. Due to lack of ground guidance commands, the spacecraft was injected at excess speed and altitude. The spacecraft missed the moon by approximately 22,000 miles.

(b) RA-4 was launched from AMR Pad 12 on 23 April 1962. Launch and injection was completed as planned. Due to an undefinable difficulty in the spacecraft, useable telemetry was not received and commands could not be given. The spacecraft impacted on the far side of the moon. This was the first lunar impact of a spacecraft launched by the United States.

(c) RA-5 was launched from AMR Pad 12 on 18 October 1962. Launch and injection was completed as planned. A problem within the spacecraft prevented the solar panels from supplying power for spacecraft operation. Battery power was depleted before a mid-course correction could be made. The spacecraft passed within 450 miles of the moon.

(3) At the time of transfer to NASA, Block III and Block IV launches were scheduled for the 1964-1965 time period.

4. PROGRAM SUMMARY - MARINER R

a. PROGRAM MISSION AND OBJECTIVES. The Mariner R objectives were to validate the spacecraft's long-range communications system and to make scientific measurements in the interplanetary space between Earth and Venus and in the vicinity of Venus.

(1) Two launches were planned and accomplished using Atlas/Agena B vehicles.

(2) The SSD technical responsibilities relating to this program terminated at completion of second launch. Data interpretation by NASA is continuing.

b. PROGRAM FUNDING. See paragraph 3.b.(Ranger funding).

c. CONTRACTUAL INFORMATION. See paragraphs 2.(Contracts Summary) and 3.c.(Ranger contractual information).

d. SIGNIFICANT EVENTS

(1) Mariner R-1 was launched from AMR Pad 12 on 22 July 1962. The launch was normal until the flight deviated in trajectory because of erratic steering commands. The vehicle was destroyed by the Range Safety Officer prior to Agena separation.

(2) Mariner R-2 was launched from AMR Pad 12 on 27 August 1962. The launch resulted in a successful injection of the spacecraft. The spacecraft accomplished the Venus fly-by on 14 December 1962, approaching within 21,000 miles of the planet. Scientific data was successfully collected and transmitted to Earth.

5. PROGRAM SUMMARY - MARINER C

a. PROGRAM MISSION AND OBJECTIVES. The Mariner C objectives are to make scientific measurements in the interplanetary space between Earth and Mars and in the vicinity of Mars.

(1) Two launches are planned for the fourth quarter of 1964 using the Atlas/Agena D launch vehicle.

(2) The program time span is from 1 February 1963 to 15 February 1965.

b. PROGRAM FUNDING. Initial funding for the Mariner C program was received on NASA Order No. H-49600, dated 7 December 1962, in the amount of $500,000. An additional $2,650,000 was allotted on 17 May 1963 by Amendment #1 to the original NASA order. On 13 June 1963, Amendment #2 decreased funds by $100,000. Total funding received prior to transfer was $3,050,000.

c. CONTRACTUAL INFORMATION. A Letter Contract, AF 04(695)-291 was let to Lockheed Missiles & Space Company on 1 February 1963. This Letter Contract was transferred to NASA Lewis Research Center on 17 June 1963.

d. SIGNIFICANT EVENTS. None. In the four and one-half months the contract had been in effect prior to transfer, technical progress was normal and no major problems had been encountered.

6. PROGRAM SUMMARY - EGO

a. PROGRAM MISSION AND OBJECTIVES. The objectives of the Eccentric Geophysical Observatories (EGO) program are to prove the capability of a new type, standard design spacecraft and to gather data concerning the geophysics of the outer regions of the earth's environment.

(1) The 900 lb. EGO spacecraft will be of standard OGO (Orbiting Geophysical Observatories) design. OGO is the generic name of a standard spacecraft design capable of carrying fifty different types of experiments and incorporating its own communications and control system. It has been dubbed the first "Space bus" for geophysical measurement equipment.

(2) The EGO spacecraft will be launched by an Atlas D/Agena B combination into an elliptical earth orbit with an apogee of 50,000 nautical miles and a perigee of 160 nautical miles.

(3) EGO will be launched from AMR Pad 12. The launch azimuth will be 106 degrees with an inclination angle of 31 degrees prograde. Two launches are scheduled, the first in 1964 and the second in 1965.

b. PROGRAM FUNDING. Funding for the system integrating portion of the EGO program was made a part of the overall funding provided by NASA Order NAS 8-73 (originally S-4601-G) for NASA Agena B Programs. This order did not break-out funding for individual programs. The total funding received on this order was $73,723,313 at the time of transfer to NASA LeRC.

c. CONTRACTUAL INFORMATION. In early 1962, the Lockheed Missiles & Space Company was requested to quote on the integrating contractor function of the EGO program and the cost of supplying two Agena B vehicles. The proposal was negotiated in September 1962 for $5,939,500, and the EGO effort was added as Part 2 to the basic Ranger/Mariner contract AF 04(647)-592. The contract was transferred to NASA LeRC on 14 June 1963.

d. SIGNIFICANT EVENTS. At the time of transfer to NASA LeRC, the EGO contract with LMSC was progressing normally. The earlier severe restrictions placed upon the Agena B by the EGO mission had been solved. The required payload weight capability exceeded that of a "standard" Agena B. The requirement was met by extensive re-design of the forward equipment rack, the guidance junction box and the electrical system. The program was on schedule at time of contract transfer.

7. PROGRAM SUMMARY - POGO

a. PROGRAM MISSION AND OBJECTIVES. The objectives of the Polar Orbiting Geophysical Observatories (POGO) program are to prove the OGO spacecraft concept (see paragraph 6.a.(1), EGO program) and to obtain measurements within the ionized belts surrounding the earth.

(1) The 900 pound POGO spacecraft will be launched by a Thor/Agena D combination into a polar orbit with a 500 nautical mile apogee and a perigee of 160 nautical miles.

(2) The Nimbus type shroud, supplied by Douglas Aircraft Company, will provide the necessary protection to the spacecraft during ascent. Following injection, the mission of the launch vehicle is complete.

(3) Two launches are scheduled, one in 1964 and the second in 1965.

b. PROGRAM FUNDING. Initial funding for POGO contract AF 04(695)-284 was received on 23 May 1963 by NASA Order C-1221A in the amount of $800,000. No additional funding on this order was received prior to transfer of the contract to NASA LeRC.

(1) The preliminary POGO study effort was funded from NASA Order NAS 8-73 (previously Order S-4601-G) which was the basic order funding NASA Agena B progrsms. Approximately $64,000 was expended on this study effort prior to March 1963 termination.

c. CONTRACTUAL INFORMATION. In July 1962 the Air Force submitted a request for bid to LMSC for the effort required to adapt an Agena D to the POGO mission and for the system integration function. Contract AF 04(695)-284 was negotiated in June 1963 for 2.47 million dollars. The contract was transferred to NASA LeRC on 1 July 1963.

(1) Earlier, a small effort was let to LMSC under the provisions of contract AF 04(695)-592 (Ranger/Mariner) to conduct the long-lead study effort required for the POGO program. The period of performance on this study was December 1962 to April 1963. All effort on this portion of the -592 contract had been completed prior to negotiation of the prime POGO contract.

d. SIGNIFICANT EVENTS. None. Contractor performance had not progressed beyond study effort phase at time of transfer.

8. PROGRAM SUMMERY - FIRE

a. PROGRAM MISSION AND OBJECTIVES. The FIRE program was established to determine by flight test the problems associated with re-entry in the lunar speed range. This includes investigation of total heat transfer, hot air radiance, materials response and radio blackout effects at approximately 37,000 feet per second re-entry speed. Only crude approximations exist of the environmental conditions for these re-entry speeds and there is no current prospect that research in ground facilities alone will resolve the uncertainties.

(1) Two flight tests, a primary and a backup four months later are planned. The FIRE spacecraft will be placed into a ballistic trajectory by the Air Force LV-3A space booster. The X-259 solid rocket motor included in the velocity package portion of the spacecraft will be ignited such that the re-entry package portion of the spacecraft arrives at an established re-entry point with the desired initial conditions, including a 37,000 fps speed.

(2) A recording system in the re-entry package which is scheduled to play back between the end of radio blackout and splash make recovery unnecessary and no recovery efforts are planned.

b. PROGRAM FUNDING. By NASA direction, $200,000 which had been received on NASA Order 30220 for booster procurement was used to initiate the FIRE systems integration contract. This $200,000 was to be repaid to the NASA booster fund by NASA Langely Research Center (LRC). Additional funding was received specifically for the FIRE contract on Amendments 4 and 7 to NASA Order 30220. When the contract was shifted from SSD to LRC on 10 July 1963, a total of $950,000 had been received.

c. CONTRACTUAL INFORMATION. On 26 June 1962, CCN #190 entitled Project FIRE - Dynamic Analysis was issued to the booster procurement contract AF 04(647)-699 with GD/A. This was followed on 6 July 1962 by CCN #197 to the same contract which was titled Project FIRE - Integration Activity. Letter Contract AF 04(695)-189 with GD/A was distributed in August 1962 and established GD/A as the system integrator for Project FIRE.

(1) In November 1962, Amendment 1 to the Letter Contract was issued - establishing the statement of work for the generation and checking of booster ascent guidance equations for the FIRE Program.

(2) The CPFF definitized contract AF 04(695)-189 was distributed in April 1962 and on 10 July 1963 was transferred from SSD to Langley Research Center as NASA contract NAS 1-3122.

d. SIGNIFICANT EVENTS. No launch results exist on this program as yet. The complexities of the velocity package and particularly the re-entry package have caused many problems and several program slippages. The re-entry package (NASA procurement) is the pacing item of the program. However, the Air Force integrating contractor started out well behind the hardware being integrated and valuable time was lost while the integrator "came up to speed." The bench mark data, resulting from re-entry information secured in flight test, which this program will secure will be of great value to succeeding programs.

9. PROGRAM SUMMARY - OAO

a. PROGRAM MISSION AND OBJECTIVES. The primary objective of the Orbiting Astronomical Observatory (OAO) program is to place above the earth's atmosphere a precisely oriented stable platform (spacecraft) in which telescopes and other scientific apparatus will be mounted for the acquisition and transmission of data relative to astronomical phenomena. The launch vehicle will consist of an Atlas booster on which is mounted a completely enshrouded Agena D second-stage booster and spacecraft. The Program span extends from 1 January 1962 through 15 May 1965 with one launch approved.

b. PROGRAM FUNDING. Initial funding for the OAO Program was received via Marshall Space Flight Center, message M-L&M-P-11-1, dated 9 November 1961, which authorized initiation of $250,000 of the funds made available under Amendment 10, dated 27 September 1961, to NASA Order NAS 8-73. Total funding received from NASA at the time of transfer of the LMSC contract to Lewis Research Center (LeRC) was $2,425,000 excluding the funding for Atlas and shroud effort which was provided for under the lump sum funding for General Dynamics/Astronautics (GD/A) contracts covering Atlas boosters for all Program Office missions.

c. CONTRACTUAL INFORMATION. Letter Contract AF 04(695)-59 was issued 13 November 1961 for the LMSC effort required to provide a mission modified Agena D and to perform the role of overall launch vehicle systems integrating contractor. Contract target cost and fee (7.1%) were negotiated for a total of $4,551,750 and the definitized CPIF Contract was issued 28 December 1962. This contract was transferred to NASA LeRC 14 June 1963.

(1) Original contractual direction to GD/A to provide a mission modified Atlas and shroud structure for the Agena and spacecraft was covered by CCN 6 to Letter Contract AF 04(694)-47, 11 November 1961. Because of contractual realignments, CCN 16 to contract AF 04((694)-240 was negotiated as the covering contract. A target cost of $5,665,000 for this CPIF contract (-240) was negotiated 10 September 1963. Although negotiated as a CCN to a single contract, subsequent to 10 September 1963 negotiations, the Work Statement was broken into two separate work statements for two new contracts, AF 04(695)-458 and AF 04(695)-453.

(a) Contract AF 04(695)-458 covering the mission modified SLV-3 only was to be retained by SSD. Target cost and fee (7.45%) was negotiated for a total of $1,661,739.

(b) Contract AF 04(695)-453 covering the launch vehicle shroud system, mission peculiar AGE, and the integrated structural, functional, dynamic test program, was to be transferred to NASA, LeRC. Target cost and fee (7.45%) was negotiated for a total of $4,425,304.

(c) These contracts had not been distributed at the time that this program office was relieved of all mission responsibilities in September 1963.

d. SIGNIFICANT EVENTS. The peculiar "dumbbell" configuration of OAO (a 10-foot diameter Atlas mated to a 5-foot diameter Agena upon which is mounted a 9.5 foot-diameter spacecraft) necessitates a 10-foot diameter shroud system approximately 53 feet in length which is mounted on the Atlas and encloses the entire Agena and spacecraft. Early in the program it was determined that this novel split-beam, cantilever configuration would require extensive testing. An integrated structural, functional, dynamic testing program was developed to cover a 34-week span; testing to be conducted by GD/A (with participation and support by LMSC and Grumman Aircraft & Engineering Co., spacecraft contractor to NASA, Goddard Space Flight Center (GSFC)) at the Point Loma test facilities. To be tested were an Atlas test tank, the flight Atlas tank, booster and spacecraft test adapters, an Agena test vehicle, a simulated spacecraft and a complete shroud system. The first test set up was in progress during mid-September 1963 when all technical and contractual direction to GD/A for the OAO program was assumed by the SSD Atlas office.

10. PROGRAM SUMMARY - NIMBUS

a. PROGRAM MISSION AND OBJECTIVES. The Nimbus Meteorological Satellite is a direct outgrowth of the experience and results of the Tiros series satellites. The Nimbus objectives are to obtain full picture coverage of day-time cloud cover of the entire Earth, to supply data for electromagnetic radiation maps of the Earth and its atmosphere, to obtain data for maps of night-time cloud coverage, and to conduct experiments to determine the Sun's effect on Earth's atmosphere.

(1) The Nimbus R&D satellite, containing hi-resolution TV cameras and infra-red scanning equipment, will be launched into a 600-nautical mile circular "high noon" orbit with an 80-degree inclination. The launch vehicle will be a Thor/Agena B combination. Two R&D satellites were scheduled for launch in late 1963 and early 1964 at time of contract transfer.

(2) The Nimbus Operational satellite will be launched into a 750-nautical mile circular "high noon" orbit with an 80-degree inclination. The launch vehicle will be a Thor/Agena D combination. Three Operational satellites were programmed at time of contract transfer.

b. PROGRAM FUNDING. Funding for the Nimbus program was made a part of the overall funding provided by NASA Order NAS 8-73 for NASA Agena B Programs. This order did not break out funding for individual programs. The total funding received on this order was $73,723,313 at the time of transfer to NASA LeRC.

c. CONTRACTUAL INFORMATION. A Cost Plus Fixed Fee contract, AF 04(647)-592, was let with Lockheed Missiles & Space Company (LMSC) on 17 April 1960, which covered the Ranger, Mariner R, Nimbus, A-12, and S-27 programs. The contract was transferred to NASA LeRC on 14 June 1963.

d. SIGNIFICANT EVENTS. At the time of contract transfer, there were no technical problems and progress was normal on the peculiar modification and system integration portions of the program. The several slippages in launch schedule were due to spacecraft development problems (NASA monitored contracts).

11. PROGRAM SUMMARY - A-12

a. PROGRAM MISSION AND OBJECTIVES. The A-12 ECHO Passive Communications Satellite program objectives were being re-evaluated at the time of transfer of the system integration contract from Hq SSD to NASA LeRC. At the time of transfer, the objectives were to document the use of large inflatable spheres as communications reflectors, to flight test rigid spherical passive satellites, and to conduct scientific studies on the environmental behavior of large light weight structures. No communications experiments are planned for orbital flights, but monostatic radar measurements will be made to determine the size and condition of the spherical surface.

(1) The A-12 inflatable spacecraft (NASA developed) will weigh 684 pounds. It will be placed in a near-earth orbit for limited duration by a Thor/Agena B launch vehicle.

(2) At the time of contract transfer, two A-12 launches from PMR were programmed.

b. PROGRAM FUNDING. Funding for the A-12 program was made a part of the overall funding provided by NASA Order NAS 8-73 for NASA Agena B Programs. This order did not break out funding for individual programs. The total funding received on this order was $73,723,313 at the time of transfer to NASA LeRC.

c. CONTRACTUAL INFORMATION. A Cost Plus Fixed Fee contract, AF 04(647)-592, was let with Lockheed Missiles and Space Company on 17 April 1960, which covered the Ranger, Mariner R, Nimbus, A-12, and S-27 programs. The contract was transferred to NASA LeRC on 14 June 1963.

d. SIGNIFICANT EVENTS. At the time of contract transfer, there were no technical problems and progess was normal on the peculiar modification and system integration portions of the A-12 program. The several slippages in launch schedule were due to spacecraft development problems (NASA monitored contracts).

12. PROGRAM SUMMARY - S-27

a. PROGRAM MISSION AND OBJECTIVES. The objectives of the S-27 Ionospheric Topside Sounder program were to inject a spacecraft provided by the Canadian Defense Research Telecommunications Establishment (DRTE) into an 80-degree prograde, 540 nautical mile circular orbit by means of a USAF launch vehicle system consisting of Thor and Agena B with Air Force launch services. The spacecraft was designed to:

(1) Measure the electron density distribution in the ionosphere above the F-2 layer maximum,

(2) study for a period of one year the variations of electron density distribution with time of day, latitude under varying magnetic and auroral conditions and with particular emphasis on high latitude effects,

(3) perform scientific studies and data collections on the ionosphere above the F-2 layer maximum: cosmic noise level, plasma frequency at orbital altitude, electron density gradient, and cosmic particle density.

b. PROGRAM FUNDING. Funding for the S-27 program was made a part of the overall funding provided by NASA Order NAS 8-73 for NASA Agena B Programs. This order did not break out funding for individual programs. The total funding received on this order was $73,723,313 at the time of transfer to NASA LeRC.

c. CONTRACTUAL INFORMATION. A Cost Plus Fixed Fee contract, AF 04(647)-592, was let with Lockheed Missiles and Space Company (LMSC) on 17 April 1960, which covered the Ranger, Mariner R, Nimbus, A-12, and S-27 programs. The contract was transferred to NASA LeRC on 14 June 1963.

d. SIGNIFICANT EVENTS. The S-27 was launched from Vandenberg AFB, Complex 75-1-1, on 28 September 1962. Operation of all systems through the Agena second burn shutdown successfully placed the Agena and S-27 spacecraft (Alouette) in a nearly circular orbit at the intended altitude. Spacecraft performance was very successful and the backup launch vehicle was assigned to another program after thirty days of data was received from the orbiting satellite.

(1) This was the first joint United States - Canadian space effort and the first launch of a spacecraft produced completely by a nation other than the U.S. or U.S.S.R.

(2) Tracking and data exchange involved the NASA Minitrack Net along with Canadian and British Stations.

File 251

6 MAR 1963

Dr. Robert C. Seamans, Jr.
Associate Administrator
National Aeronautics and Space Administration
Washington 25, D. C.

Dear Bob

I have looked over the draft of a revised organizational and procedural arrangement for managing the Agena launch vehicle effort associated with the NASA unmanned space program which you sent me after our last meeting. As I am sure you understood from our conversation, I view this matter as a part of the broader problem of how best to handle Air Force cross-servicing relationships with NASA in the future. Consequently, rather than commenting on the NASA draft, paragraph by paragraph, I will outline the policy I believe the Air Force must follow in assuming responsibilities in support of NASA programs, and suggest some guidelines for preparation of a revised Agena agreement which I believe will achieve the principal goals NASA is seeking.

SCGV

It is altogether apparent that the NASA and the Air Force will have continuing reason to work together on programs of mutual interest. I strongly believe, therefore, that our two agencies should set as a joint objective, arriving at conditions for cross-servicing which will minimize needless duplication.

As far as Air Force cross-servicing of NASA is concerned, as an important step toward this objective we plan to concentrate our support effort on NASA programs --

1. Which have the greatest military potential.
2. For which NASA needs Air Force support.
3. In which Air Force responsibilities are unique and clearly defined.

Of our two largest support efforts, one -- the launch vehicle portion of Mercury and now Gemini -- singularly meets the conditions mentioned above. We are vitally interested in Gemini for its military potential, as you know. Furthermore, with the changes now being made in target program management, the Air Force will be solely responsible to the NASA mission director for the vehicle development and flight operations package in Gemini as in Mercury.

In order to do all possible to make a success of our part of Gemini, we expect to dedicate substantially more manpower to the program. In fact, I find that we can very constructively use on Gemini all of our people presently working on the portion of the NASA Agena program which you want to take over. Furthermore, our exodus at this point will remove the duplication of responsibility and effort which has caused friction under the existing Agena agreement.

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I, therefore, agree with your proposition that a new agreement should be developed for the NASA Agena program. I further suggest that a small NASA-AFSC task group be set up by Mr. Cortright and General Ritland to prepare a new agreement with the following precepts as their point of departure:

1. NASA to be represented on the technical groups monitoring the development of the Standardized Atlas, and on the Configuration Control Boards of the Standardized Atlas and the Agena D.

2. NASA to buy standardized stages from the Air Force, accepting them on a DD 250 after they are delivered to the Air Force.

3. NASA to assume present Air Force responsibilities for flight planning and adapting standard stages to NASA missions.

4. NASA to be responsible for launch operations from Complex 12 at AMR.

5. Air Force to be responsible for launch operations at PMR.

If you accept these fundamental points, I suggest that they immediately become the basis for all further planning and actions toward the next and subsequent NASA Agena flights.

Sincerely

SIGNED

B. A. SCHRIEVER
General, USAF
Commander

ANALYSIS OF THE QUESTION OF THE FUTURE AIR FORCE ROLE IN THE NASA ATLAS AND THOR AGENA PROGRAM

Purpose: To construct the basis for a revised AF/NASA agreement on Atlas, Atlas and Thor/Agena which:

1. Will preserve Air Force participation in the present NASA launch program at AMR to the extent which will contribute most to a 6555th ATW capability to handle space programs of greater military significance.

2. Will avoid over commitments of Air Force manpower resources.

3. Will not have to be changed if the Air Force undertakes a manned space program based on Gemini.

4. Will avoid overlapping or hazy zones of responsibility and authority.

5. Will permit NASA objectives to be attained and will conform sufficiently to NASA convictions on approach so that it can serve as a point of departure for more detailed negotiations.

Scope

1. Thor, Atlas and Agena stages for NASA unmanned missions only. (Note: The Air Force at SSD and the 6555th ATW will have complete booster responsibility for Mercury and Gemini including the Gemini target, reporting directly to the Mercury and Gemini project offices at Houston and the Cape)

2. Development and production of standard stages.

3. Design, development and checkout of NASA mission peculiar modifications.

4. Flight planning and systems integration.

5. At AMR: range requirements documentation, assembly, checkout, and launch operations.

Discussion

1. NASA Situation

(a) NASA cites reliability as the primary purpose motivating their proposal to take over the direction of their unmanned Agena program. NASA expresses dissatisfaction over the record of Ranger and Mariner Atlas Agenas (three successes out of seven the way they keep books on this program). They are, of course, familiar with the major Air Force effort underway to improve reliability in the form of the standardized Atlas and Agena D programs. Actually, the NASA people pressing for a NASA-directed unmanned Agena program are powerfully and probably principally influenced by an ambition to run their own show, and they are organizing and manning on the assumption that they will do so.

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(b) Within NASA, there was a complete shift of field responsibilities for the NASA Thor and Atlas Agena programs on the 28th of January. Lewis Research Center will replace Marshall Space Flight Center and Goddard Space Flight Center (Bob Gray who heads the Delta launch program) will supplant LOC at the Cape.

(c) Basically, NASA is asking for the following in a new agreement with the Air Force on the Thor and Atlas Agena programs.

✓(1) Participation by Lewis people in the technical phases of standardized stage programs sufficient to know the characteristics of the hardware they are buying and to express NASA requirements and ideas regarding standard stage development.

✓(2) To buy standard stages from the Air Force, accepting them on a DD 250 after they are delivered to the Air Force.

✓(3) To have full charge of the program to adapt to their purposes and launch the stages they buy, including contract direction and control over associated facilities and equipment.

(d) The NASA Program on Stand 12 shows no shots until at least August of 1963 due to Ranger technical difficulties. Beyond that date, the planned NASA program will saturate Stand 12, probably with some overflow for which they will seek accommodation on Air Force Stand 13. For example, eleven Atlas Agena shots from AMR are planned for the NASA unmanned program in calendar 1964.

(e) NASA plans to build up to about 200 people by 1964 to carry out this program, approximately 20 of which would be located at the Cape and about 20 at contractors' plants and at SSD.

2. Air Force Situation at SSD

(a) Major Jack Albert heads a 10-man group responsible for Thor and Atlas Agena boosters for all NASA programs, including the Atlas Agena target for Gemini. He is supported as required by the Thor, Atlas and Agena stage offices at SSD.

(b) The program to develop a Gemini target from the Agena D stage involves about $30 million in non-recurring costs, at least as much as the cost of developing the Standardized Agena D from the B.

(c) NASA Hq agreed to eliminate Marshall as a Gemini target technical support agency on the assurances that SSD would assign sufficient people of adequate calibre to satisfy MSC that the project will be competently managed.

(d) SSD is voluntarily offering NASA membership on the technical teams monitoring the development of the standardized Atlas, and on the Atlas and Agena D configuration control boards. These people will represent NASA interests and although they will have no veto power, can appeal unfavorable decisions through NASA channels.

3. Air Force Situation at AMR

(a) One 6555th launch crew supervises the checkout and launch of Mercury Atlases from Stand 14 and NASA Atlas Agenas from Stand 12. So far, launchings from these two stands have been sufficiently spread out so one 6555th team can handle the job.

(b) The last Mercury Atlas will be launched not later than July of this year. Stand 14 will then be modified to launch the Gemini Atlas Agena target, the first flight of which is now slated for September 1964.

(c) The next launching from Stand 12 will occur not before August of this year, and more likely about October, followed by an active NASA launch schedule.

(d) The 6555th will need to use Complex 12 and associated AGE for training purposes through June of this year. Colonel Russell concludes that beyond this date, the 6555th will make surer and faster progress toward their primary goals of achieving a blue suit launch capability on Complex 13 and preparing to do a thoroughly competent job of supporting the Gemini program on Complexes 14 and 19 if they pass the responsbility to NASA for the Stand 12 operation, restricting participation in that operation to assisting Bob Gray in the modification and checkout of the Complex and providing other advice and assistance as requested.

(e) Under the 17 January 1963 Webb-McNamara Agreement on AMR relationships, NASA has the option to assume accountability for Complex 12 if NASA becomes responsible for the launch function at this Complex.

(f) The standardized Atlas CPIF contract spans development, production, and launch of 33 vehicles. The fact that the incentive features of this contract cover launch services complicates transferring to NASA the launch responsibilities which the 6555th ATW has discharged under the present NASA-Air Force Agena agreement. It would be preferable from the Air Force point of view to avoid assigning to NASA the technical direction of a part of an Air Force contract, particularly one with incentive fee provisions. However, Colonel Creech, Chief of the Test Site Office of the Western Contract Management Region, concedes that there is no fundamental reason why it cannot be done providing the NASA launch controller will agree in writing to a reasonable working arrangement with the Air Force ACO, and to adhere to the terms of the contract as interpreted by the Air Force ACO. However, the NASA will almost surely find the terms of the contract unduly confining. The contractor, with his fee in this case dependent on avoiding anomalies during countdown and flight while minimizing cost, will tolerate little interference by responsible government technical people, whether NASA or Air Force.

(g) Another solution would renegotiate the Atlas CPIF contract, splitting it three ways. One Air Force contract would cover development and production through plant buy-off as is done in the case of Agena D, resorting to separate Air Force and NASA launch services contracts at AMR. This approach has other reasons to recommend it. The Air Force faces an unsolved problem in reconciling a CPIF contract which covers flight performance, with a completely blue-suit launch operation. This contradiction is one of the factors standing in the way of a blue suit operation at PMR and will frustrate a blue suit operation at AMR if any standardized boosters are launched from Stand 13 after the presently programmed series of five vehicles which are carry-overs from the CPFF contract for Atlas boosters antedating the standardized bird. It thus appears that incentive coverage of countdown and launch performance and costs will have to go if we are serious about blue-suit operations. Furthermore, any more cancellations of Atlas booster requirements by NASA or the Air Force will require a renegotiation of the contract in any case since the boosters now on contract will fully cover all present program orders.

(h) On the other hand, Colonel Brandeberry is satisfied that the price will rise if negotiations are reopened--how much he cannot estimate. Also, this contract, with its combined performance and cost incentives, represents a significant milestone in incentive fee contracting. Any abbreviation of the incentive features of this contract would be viewed as a grave loss of hard-won ground by many policy-makers who are pushing the incentive-fee formula.

Conclusions

1. The trend in military development and exploitation of space is toward manned activities in earth orbit and the use of launch vehicles, such as the Titan III, larger than the Atlas Agena.

2. Gemini, with its manned rendezvous operations and land retrieval capability, is the only NASA program in which we stand to gain from our supporting effort enough knowledge and experience of importance to future military space activities to be worth the manpower we would be obliged to commit.

3. Turning over to NASA the responsibility for the functions being performed by SSD and the 6555th for the NASA unmanned Atlas Agena program will not leave the Air Force people involved even temporarily with little or nothing to do. On the contrary, these and more will be needed to do justice to the support we are pledged to provide the NASA Gemini program, and at the same time to carry out Air Force programs including whatever Air Force participation in the Gemini spacecraft and flight missions program grows out of the 22 January NASA-DoD agreement on Gemini. For this reason, --

4. NASA is not duplicating an Air Force capability by expanding their Lewis and Goddard staffs to handle their own unmanned Agena program because otherwise the Air Force would have to expand our NASA support effort. This does not apply to PMR where the Air Force should perform all Agena launchings.

5. On balance, it is to Air Force advantage to assign to NASA the full responsibility for NASA unmanned program Atlas Agena operations beyond DD 250 buy-off, except for PMR launch operations which NASA wants the Air Force to keep anyway. Also, we have no good excuse for retaining the responsibility in the face of a NASA desire to run their own program. Under today's situation we cannot accurately plead duplication. Also, now that we are dealing in standardized launch vehicle stages and the missile R&D program is behind us, we can no longer insist on directing the contracts for their birds in order to insulate Air Force missile contracts from NASA interference.

6. DD 250 buy-off is a logical point for transferring to NASA the responsibility for their stages. NASA should not be permitted to dilute Air Force responsibility up to that point by installing engineering monitors in contractor plants.

7. The Air Force position on whether NASA should have their own Atlas launch services contract at AMR should depend on whether we break the standardized Atlas CPIF contract at buy-off in order to have an all-blue suit operation at PMR. If we do, we should not stand in way of NASA having their own launch services contract. If, on the other hand, we continue with the present CPIF contract, we should offer NASA the right to perform the technical surveillance function under the Air Force contract as agent for the Air Force ACO. If they persevere in holding out for their own launch services contract, they should be asked to appeal the matter to OSD, since we should not reduce the coverage of performance and cost incentives on the strength of a NASA request.

8. NASA will need 6555th assistance in the modification of Complex 12 for the standardized vehicle. Also, NASA will want to participate in the Air Force Atlas and Agena spares program. Furthermore NASA, and to a lesser extent the Air Force will gain program insurance if the configurations of Complex 12 and other Atlas Agena launch facilities can be kept sufficiently standardized so launch programs can be moved from complex to complex should scheduling conflicts develop or a stand suffer major damage. The Air Force should therefore propose as part of the new agreement a mechanism to promote sufficient standardization of vehicles, AGE, and launch facilities to satisfy this requirement. In fact, the arrangement between Goddard and the 6555th for accommodating the Delta program on Complex 11 should be proposed as the point of departure for developing a satisfactory local relationship when Goddard assumes launch responsibility for the NASA unmanned Agena program.

9. The Air Force should no longer delay stating how far as a minimum we are willing to go in the direction NASA desires. As noted above, NASA is in the midst of reorganizing their Agena field activities. Also, contractural and other preparations are underway for the next Ranger and subsequent NASA Agena launchings. Then, too, SSD needs to know their continuing responsibilities toward this NASA program. The situation at AMR is not so urgent, but both the 6555th and Goddard need to learn their future responsibilities as soon as possible. Finally, we can be sure that if we postpone too long telling NASA whether we will go along with their taking over the main functions SSD and the 6555th are now performing for them, NASA will take the matter to DDR&E. If we do state a minimum position at this time, planning in urgent areas can move forward while details are being negotiated by a negotiating team.

Recommendations

That the attached letter to Dr. Seamans be signed. It takes a stand on the central policy matter involved which is consistent with the AFSC position on our relationships with NASA in other allied areas, such as the management relationships between AFMTC and LOC at AMR. It says, in effect, that we will start more detailed negotiations with them on the bases of the four points enumerated in the letter. It is believed that this letter will be accepted by NASA as a satisfactory basis for appointing a small group consisting of about one Hq staff and one field representative from each agency to prepare a new agreement.

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SSVAT File CY 7-5[illegible]

SSVAT/Capt [illegible]/643-6072

3 - JAN 1964

Summary of Transferred NASA Agena Programs

Hq AFSC ([illegible])

1. The attached report is submitted in accordance with Hq AFSC directive message SCSA 7-12-6. The report summarizes the NASA Agena program effort which was transferred from Hq SSD to NASA Lewis Research Center (LeRC) and NASA Langley Research Center (LRC) during 1963. It should be noted that the transfer applied only to responsibilities of the SSD program office (SSVAT). This included coordination and liaison activities relating to component procurement, as well as technical direction of peculiar modification and system integration contracts. Procurement of launch vehicles, stages, AGE and launch services is now being ordered directly by NASA from the appropriate SSD offices.

2. The individual program summaries contained in the report are lacking in detail in some instances. Original NASA direction and funding for several programs was grouped under the overall title "NASA Agena B Programs." Air Force contracts covered these same several programs, with no funding breakout for individual projects. Similarly, technical progress reports were not written for individual programs. Instead, contractor reports covered functional areas of effort for the several programs. In addition, with three exceptions, the officers assigned to the transferred NASA programs are no longer assigned to Hq SSD. Detail information on the programs monitored by these officers has therefore been difficult to gather.

3. This report constitutes final close-out action by SSVAT on all NASA programs other than Gemini Agena Target Vehicle. Following the transfer of individual contracts and programs, only "Pearl Harbor" files were retained by SSVAT. Because all SSD program office activity on the transferred NASA programs has now been terminated, these files are being prepared for shipment to permanent Air Force storage.

SIGNED

CHARLES A. WURSTER, Major, USAF
Chief, Gemini Agena Division
S-01A Space Project Directorate

1 Atch
NASA Agena Summary Rpt,
dtd 31 Dec 63

17-4

OFFICE SYMBOL	ORIGINATOR SSVAT				
NAME (SIGNATURE)					
DATE	2 Jan 64				

SSD FORM JUL 62 11 COORDINATION SHEET

~~CONFIDENTIAL~~

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HEADQUARTERS
SPACE SYSTEMS DIVISION
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
Air Force Unit Post Office, Los Angeles, California 90045

REPLY TO ATTN OF: SSVA

FEB 4 1964

SUBJECT: Historical Report: 1 July 1963 - 31 December 1963

TO: SSEH

1. Throughout the reporting period this organization has been directed by Col Edward F. Blum and has been assigned to the Deputy for Engineering (SSV). In addition to the previous responsibilities, the Gemini Agena Division (SSVAT), under the direction of Maj Charles A. Wurster, was assigned to SSVA in October 63. (see atch 6). At that time also, a Command Control Section was established within the Vehicle Engineering Division (see atch 2). (U)

2. On the 12th of July 63 the 100th Agena space vehicle was launched. During the reporting period fourteen (14) Agena D and one (1) Agena B vehicles were successfully launched and injected into orbit. All remaining vehicles under production contract AF 04(695)-68 were accepted during this period and some vehicles produced under the AF 04(696)-194 were accepted. The final S-01A vehicle was accepted in December 1963. Those vehicles under the present production contract (-194) which incorporate the features of contract AF 04(695)-191 are designated as S-01B. (U)

3. Development of the XLR 81-BA-13 engine has continued during this period. Its purpose is to provide a multi-start capability for the Gemini Agena Target Vehicle. The feasibility study for converting the Agena engine for use with Hybaline fuel instead of UDMH extended into this period. Interest in this area continues and a follow-on test program was initiated. (U)

4. The most significant completed achievement of the AGE Division was the reconversion of PALC-1, Pad 1 under contract AF 04(695)-354. A Vehicle on Stand capability was attained on 27 September 1963. (U)

5. Significant briefings presented during this period:

a. Col Blum briefed Secretary McMillan on 25 July 1963, presenting an Agena Reliability Review.

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When inclosures are withdrawn the classification of this correspondence will be downgraded to [illegible] in accordance with AFR 205-1.

~~CONFIDENTIAL~~

b. Col Blum briefed Gen Funk on 3 September 63 on a Procurement Plan for the YLR 81-BA-11 Engine. The plan recommended buying the Agena engine directly from Bell Aerosystems Co with an estimated annual saving of $800,000. After due consideration of all factors this plan was rejected.

c. As a member of a party headed by Gen Funk, Lt Col Barnes briefed Gen Schriever on S-01A Reliability on 2 October 63.

d. Hybaline Fuel Briefings:

(1) Col Blum, Lt Col Le Beck and Lt Col Goppert briefed at AFSC and USAF on 29-31 July 1963.

(2) Lt Col Le Beck briefed at RTD, AFSC and USAF (Dr Flax) on 10-11 September 1963.

(3) Lt Col Le Beck briefed the Aeronautics and Astronautics Coordination Board Launch Vehicle Panel on 21 November 1963. (U)

6. Detailed historical data is presented by each Division of this Directorate in attachments 1-6.

Edward F. Blum
EDWARD F. BLUM
Colonel, USAF
Director, S-01A Space Project

Atch 3 + 4 Only

6 Atch
~~1. Historical Data, SSVAC (C)~~
~~2. " " SSVAE (U)~~
3. " " SSVAG (C)
4. " " SSVAK (U)
~~5. " " SSVAR (C)~~
~~6. " " SSVAT (C)~~

filed Dest has 25 atchs

filed in Gemini Target file

~~CONFIDENTIAL~~

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S-01A AEROSPACE GROUND EQUIPMENT DIVISION
HISTORICAL DATA

SSVAG

1 JUL 1963 - 31 DEC 1963

1. (~~C~~) Reconversion of PALC-1, Launch Stand 1 to an SLV-2A/S-01A configuration (which began 19 April 1963) was completed under Contract AF 04(695)-354. A Vehicle on Stand (VOS) capability was realized on 27 Sep 1963. The conversion schedule of less than six months was one of the most ambitious undertaken by AFSSD to date. Work remaining to be accomplished under the -354 Contract is the conversion of PALC-1, Launch Stand 2 to an SLV-3/S-01A configuration. This contract has had a total of four (4) CCNs, two of which are no cost. The remaining two CCNs (CCN-1 and CCN-4) are both credit CCNs, a result of program redirection. The first CCN deleted a planned dual capability on both pads and the fourth CCN changed the required configuration of Launch Stand 2 from a 4805 vehicle to a 1172 vehicle. This CCN also consolidated all three previous CCNs. The -354 Contract was negotiated for 4.6 million dollars. The Contractor's proposal for CCN-4 is a \$590,000 credit. Authority for this conversion is SSGS secret letter, subject: PALC-1 Complex, dated 29 March 1963.

2. (U) Efforts continued on the conversion of AMR Complex 14 to a S-01C configuration under LMSC Contract AF 04(695)-287. In addition, Secondary Propulsion System (SPS) support requirements were procured under Supplemental Agreement Number Two to this contract. The presently scheduled Vehicle on Stand capability date is 1 Nov 1964. A total of \$2,132,500 in FY-63 funds were obligated. An additional \$2,500,000 are programmed for FY-64. Authority for this conversion was SSVZO letter, subject: Conversion of AMR Complex 14 to an Atlas/Agena Configuration, dated 5 Jul 1962.

3. (U) A memorandum of understanding was negotiated with the Sacramento AFLC Depot (SMAMA) to provide storage of the Disaster Pool AGE which is to be delivered March through May 1964. This equipment consists of eleven items of AGE which is being procured under LMSC Contract AF 04(695)-317. The items selected have a three month or greater lead time that from previous experience has been determined to be subject to major damage in the event of a launch stand disaster. The equipment will be stored at SMAMA and will be available for immediate issue, thus greatly reducing the time that would be required to refurbish a damaged launch stand to a usable condition. The contract has been negotiated for \$970,000, fixed price, and all equipment is to be delivered by 1 March 1964. Authority for the procurement of Disaster Pool AGE is SSVZO letter, subject: Agena Items for Disaster Pool Backup, dated 6 Jun 1962.

DOWNGRADED AT 3 YEAR INTERVALS;
DECLASSIFIED AFTER 12 YEARS.

~~CONFIDENTIAL~~

4. ~~(C)~~ PALC-2, Stand 4, was converted to Program 206 configuration under CCN-3 to LMSC Contract AF 04(695)-131. This conversion was completed on 1 Nov 1963 at a cost of $1,194,000 which was funded from P630 monies. Authority for this conversion was SAFSP-206 confidential letter, subject: Modification to Pad 4, dated 24 Apr 1963.

5. ~~(C)~~ PMR Launch Capability Contract AF 04(695)-233 Supplemental Agreement Number Seven was negotiated and definitized at $2,191,000. The added effort covered by the supplemental agreement included round the clock support for GE as requested by Program 206, launch accelerations and pad changes for Program 162, full operation of PALC-1, Pad 1 after 26 Sep 1963 in support of Program 162 plus other added miscellaneous efforts. PALC-1, Pad 1 and Pad 2 were not carried on the Launch Capability Contract from 1 Jul 1963 to 26 Sep 1963 and 1 Aug 1963 to 31 Dec 1963 respectively due to pad modification being accomplished by LMSC under Contract AF 04(695)-354.

6. (U) Action was taken to initiate a contract with LMSC for launch services at PMR during CY-64 as a follow-on to Contract AF 04(695)-233 which terminated on 31 Dec 1963. The follow-on letter contract, AF 04 (695)-501, was costed by LMSC for a total of $32,825,000 including fee. Fact finding session was held at VAFB during November. Negotiations have been scheduled for 27 Jan 1964. The definitized contract will be CPIF with incentives for both cost and performance.

7. (U) Supplemental Agreement Number Five to the AMR Launch Capability Contract, AF 04(695)-198 with LMSC, was negotiated and resulted in a credit of $1,872,000 to the contract resulting in a total contract cost of $4,120,000. Program redirection, as covered by Supplemental Agreement Number Five, was necessary due to the cancellation of all launches for the period 1 Jan 1963 to 31 Jul 1963. This contract terminated 31 Dec 1963.

8. (U) Action was taken to initiate a contract with LMSC for launch services at AMR during CY-64 as a follow-on to Contract AF 04(695)-198 which terminated on 31 Dec 1963. The follow-on letter contract, AF 04(695)-499, was costed by LMSC for a total of $6,111,925 including fee. Fact finding session was held at VAFB during November. Negotiations have been scheduled for 27 Jan 1964. The definitized contract will be CPIF with incentives for both cost and performance.

9. (U) AGE work statement evaluation, cost proposal evaluation and negotiation, technical direction of equipment development, and monitoring of design fabrication and installation and checkout continued during the past six months for the following programs: 162, 698BK, 206, Gemini, 461, 823, and [redacted]. 50X1

10. (U) Specific developments in support of Air Force and NASA programs were as follows: Standardized Pyrotechnic Checkout Equipment, PCM and Digital Command System, and Secondary Propulsion System Propellant Loading Equipment.

~~CONFIDENTIAL~~

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SS VAK

S-01A PROCUREMENT DIVISION HISTORICAL DATA

1 JULY - 31 DECEMBER 1963

1. The Procurement Division provides procurement management functions for the Agena and also lends this support to designated SSD and NASA Program Offices. A summary of the existing contracts follows:

CONTRACT NUMBER	PROGRAM	VALUE
AF 04(695)-21	R&D of Agena D	38.8M
AF 04(695)-52	PMR Launch Capability	19.4M
AF 04(695)-62	Advent	8.9M
AF 04(695)-68	Agena D Production	36.3M
AF 04(695)-79	Mission Peculiar Equipment	3.5M
AF 04(695)-129	Gemini - Agena Target Veh	8.6M
L/C S/A 04(695)-129	Gemini - Agena Phase II	55.0M
AF 04(695)-131	Launch Pad Modification	17.1M
AF 04(695)-135	Launch Pad Modification	4.3M
L/C AF 04(695)-191	Agena D Development	17.1M
AF 04(695)-194	Agena D Production	39.4M
AF 04(695)-198	AMR launch capability	4.1M
L/C AF 04(695)-221	Agena Repair & Logistics	.7M
AF 04(695)-233	PMR launch capability	23.9M
AF 04(695)-266	Santa Cruz Support	2.5M
AF 04(695)-257	Launch Pad Modification	3.3M
AF 04(695)-254	Agena Technical Manuals	.3M
AF 04(695)-317	A.G.E. Disaster Pool	.9M
AF 04(695)-376	Agena storage contract	.3M
L/C 04(695)-499	Launch capability	6.1M
L/C 04(695)-451	Agena D Production	23.3M
L/C 04(695)-501	Launch Capability	32.8M

2. SSVAK has as of this time, negotiated all Agena D production contracts on a fixed price incentive bases. The definitive production contracts are AF 04(695)-68 and -194. Pending negotiation, also on an FPI bases is letter contract -451.

3. The Launch Services letter contracts for AMR and PMR have been proposed by LMSC on a CPIF bases, with both a cost incentive and a performance incentive. While in the past, these contracts have been negotiated only on a cost incentive, the Air Force has reached agreement with the contractor that all future contracts will also have performance incentives.

atch 4

26

APR 16 1964

SSVAC/Maj Mehlhoff/33378

Erection of Thor-Agena Missile in Front of Bldg A

SSVA (Col Blum)

1. Some time ago Capt R. L. Rapp, Office of Information, SSE, mentioned to me that SSD had plans to erect a Thor-Agena missile in front of Bldg A, R&D Center. He was interested in obtaining an old Agena and was also working with the Los Angeles Museum so they could have like equipment on display.

2. I contacted the AFPR, LMSC and inquired about the old Agena B models that were in storage. Since they were surplus to Air Force requirements, Capt Rapp was able to obtain them direct from the AFPRO and they are now in storage in the Douglas buildings adjacent to the R&D Center, together with the adapter and shroud.

3. Yesterday, Capt Rapp called a meeting and Major Nolan and myself attended. The plans are to have a Thor/Agena missile erected in front of Bldg A by 2 June 64, which appears to be the new dedication date for this installation. Our participation, of course, is to provide information that is helpful for this cause. We are not making any engineering decisions, but are giving such help that will aid for the interface between the Thor/Agena. SSD plans to also have representatives from Douglas and Lockheed assist in the erection.

4. It would appear that this might be information that can be used for the Weekly Activity Report, and to keep you abreast of our assistance in the erection of a Thor/Agena missile in front of Bldg A.

SIGNED

C. V. MEHLHOFF
Major, USAF
Chief, Configuration Management Office

OFFICE SYMBOL	ORIGINATOR SSVAC				
NAME (SIGNATURE)	Maj Mehlhoff/deo CVM				
DATE	16 Apr 64				

SSD FORM 11 A COORDINATION SHEET

HEADQUARTERS
SPACE SYSTEMS DIVISION
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
LOS ANGELES AIR FORCE STATION
Air Force Unit Post Office, Los Angeles, California 90045

REPLY TO ATTN OF: SSVA

12 AUG 1964

SUBJECT: Historical Report, 1 January 1964 - 30 June 1964

TO: SSEH

1. During this time period 16 Agena (14 Agena D) flights were recorded, bringing the total to 130. The Agena D success ratio is presently 91%. First Article Configuration Inspection (FACI), on S-01B Vehicle AD 68 and numerous new optional kits, was successfully conducted in Feb-April 1964. The first S-01B Vehicle was successfully launched on 19 June 1964.

2. Five (5) new contracts were issued along with the definitization and administration of 21 additional contracts for a total of approximately $350,000,000 on contract. Hq USAF approval was received in April 1964 for a follow-on S-01B production contract to AF 04 (695)-451. Refer to atch 3 and 5 for comment on negotiation of L/C AF 04(695)-129. Significant contracting accomplishment was achieved in the agreement with LMSC to include the provision for both cost and performance incentives in the Launch Services Contracts (see atch 2 and 3).

3. During this period the Gemini Agena Division participated in the joint preparation of NASA MSC and USAF SSD Management and Responsibilities Agreement for the Gemini Atlas Agena Target Vehicle System Program. Negotiations were also completed for the Program's guidance equations. Mission objectives for this program were slightly redefined during this period (see atch 5). The Reliability Plan for this program was approved in May 1964 and the Gemini "Extra Care" Program was approved in April 1964.

4. The first series (Round I) of the Production Reliability Evaluation Program (PREP) was completed in May. Round II is almost complete, Round III started in March and the detailed planning for Round IV is almost complete.

5. The Aerospace Ground Equipment Division completed conversion of PALC-1, Launch Stand 2 during this period. This Division's activities were also broadened with the incorporation of applicable portions of AFSCM 375-1 in the AGE area for contract AF 04(695)-129 (Gemini Agena).

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DECLASSIFIED AFTER 12 YEARS.
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DECLASSIFIED AFTER 12 YEARS.
DOD DIR 5200.10

~~CONFIDENTIAL~~

6. At the end of this reporting period, several personnel changes are imminent. Lt Col Robert Le Beck will become Deputy Director, Lt Col Cecil Riddle will become Chief of the Vehicle Engineering Division, and Maj William Jones will become Chief of the Requirements and Programming Division. At this time it appears that the Directorate will be almost fully manned at the end of the summer rotation cycle.

7. Refer to all attachments for detailed reports of this Directorate's Divisions, as no attempt is made in this letter to cover all aspects of the Directorate's activity.

726

SIGNED

EDWARD F. BLUM
Colonel, USAF
Director, S-01A Space Project

6 atch:
Historical Data --
1. Vehicle Eng Div
2. Aerospace Grnd Equip Div
3. Procurement Div
4. Requirements & Program Div
5. Gemini Agena Div
6. Configuration Management Div

filed in Gemini

VEHICLE ENGINEERING DIVISION
S-01A Space Project Directorate

Historical Report

1 Jan 1964 - 30 June 1964

The Vehicle Engineering Division consists of two Branches, Astro Vehicle Branch and Electronics Branch. The Astro Vehicle Branch has two sections Spaceframe Subsystem and Propulsion Subsystem. The Electronics Branch consists of Electrical Power Subsystem, Guidance and Control Subsystem and Communications and Control Subsystem.

The following briefly summarizes the major activities for the various sections of the Vehicle Engineering Division for the period 1 January 1964 to 30 June 1964.

During this period a First Article Configuration Inspection (FACI) was conducted on the seventh production S01B vehicle number AD-68. This FACI was acceptable with exceptions mainly in the quality of drawings and other documentation.

Atch 1

A. Spaceframe Subsystem (SS/A)

The following items summarize activities of the Spaceframe Section during the subject time period. The major Section effort was provided to support the ABC Program, FACI of AD-68, the Gemini Target Vehicle, and S-01A/B Configuration Control with review and action on design changes. In addition, continued support has been given to all programs using Agena.

1. ABC Program

Support of the ABC Program consisted mostly of review and comments on ABC qualification and evaluation reports. The major new structural assemblies were the forward rack, containment and scavenging tanks, and booster adapter. Several new optional kits required qualification also. In addition, new specifications for the above assemblies and optional kits were reviewed.

2. FACI

FACI of AD-68 and approximately fifteen new optional kits occurred during February, March and April. In addition, members of the Section participated in acceptance of vehicles AD-62 through AD-67.

Members of the Spaceframe Section were on the AD-68 FACI Drawing Committee. Approximately 150 to 200 drawings were reviewed for acceptability and agreement with the vehicle hardware. All major assembly and sub-assembly drawings as well as a sampling of part drawings were reviewed.

During FACI of the optional kits, the kits along with all the associated drawings and specifications were checked for being correct and complete.

3. Gemini Agena Target Vehicle

In support of the Gemini program, this section has been primarily concerned with design and qualification of the Forward Auxiliary Rack Forward Section, Aft Section, and program peculiar equipment installations. To date all articles have been subjected to both dynamic (sinusoidal) and structural tests. Final reports are now being submitted for review. The only testing in the structure area that remains is an acoustic test which is planned for the near future at SCTB in conjunction with PTVA firing of the 8247 engine. The acoustic test has been recommended by LMSC loads and dynamics rather than simulating the random vibrational environment with mechanical excitation.

This section also has provided support to a failure mode analysis study which is being undertaken by LMSC. Certain situations which might lead to catastrophic failure are being investigated. Such situations include inner bulkhead reversal, engine hardover, and damage due to meteorite penetration. A report will be submitted for review in the future.

Effort has also been directed by this section in analyzing the thermal problems associated with the ATV and its mission. Investigations have been made into the problem of thermal insulation for the SPS modules as well as paint patterns for the main propellant tanks.

4. Separation Shock

Continued emphasis has been placed on determining methods of reducing pyrotechnic shock and parameters of shock propagation.

Program Plan 102 included a series of ten tests on a booster adapter and aft rack with different separation joint configurations. 10 grain MDF was used as the separation charge on all tests but one with 5 grain FLSC. It was concluded that a significant reduction in shock could not be obtained with either 10 grain MDF or 5 grain FLSC, at least with the present "state of the art" thinking. Two of these tests, one with shock mounted equipment and one without, showed that a significant reduction in shock could be obtained with shock mounting.

Program Plan 135 has resulted in the development of a shock testing facility. The design is a barrel section with stiffening rings and longerons. It has removable panels for mounting equipment. Shock excitation is provided by easily installed MDF ring charges. The facility closely simulates the actual separation shock spectrum and has been used practically to test two Aft Safe/Arm J Boxes. Now that equipment can be tested to the shock environment more accurately, LMSC 6117D will be revised with up-to-date shock requirements.

5. Vibration Analysis

Tank modal tests on a complete Agena vehicle were conducted during this period. The principal purpose of the testing was to prove the LMSC mathematical model used for the 20 cps oscillations.

The Spaceframe Section was instrumental in procuring Agena B Vehicle 502 from storage with all attachment and adapter hardware for NASA. NASA will conduct full scale vibration testing with the Agena mounted on a Thor booster at Langley Research Center. The purpose of the testing is research on vibration modes in spacecraft structures. The 20 cps problem will be an area of special interest.

6. Separation Joint Redesign

A crash program occurred during May and June to develop a new booster adapter separation joint with reduced separation shock. The redesign is a result of equipment failures during the flight separation sequence. The three joints selected for further development were the V-Band, Spring Band, and Beryllium Expander Tube joints. Each of three joints were subjected to static structural and functional development tests. Each joint demonstrated acceptable strength and functioning. Selection of one of these joints for qualification will be made after the effects of the Spring Band joint on the Thor and Atlas boosters control stability has been determined.

B. Propulsion Subsystem (SS/B)

1. YLR81-BA-9

This engine has been used in the S-01 space vehicle since December 1960. During this reporting period two of these engines were used for flight with successful engine performance.

2. YLR81-BA-11

This is the present production engine and is being utilized as the primary propulsion unit with the S-01A/S-01B space vehicles. Fourteen engines have been flown during this reporting period with successful engine operation on all flights. This engine is the same as the YLR81-BA-9 with minor modifications, principally a redesigned turbine exhaust duct.

3. YLR81-BA-13

This engine is a modification of the YLR81-BA-11 and is being developed to provide multi-restart capability for the Gemini Agena Target Vehicle (GATV).

During this reporting period the design was finalized and PFRT initiated. In the conduct of PFRT several more problems have manifested themselves. The major problems are in the area of material process control on the start tanks and corrosion resistance of the encapsulation bonding in the oxidizer gas generator valves. Engine level PFRT testing has been completed but some component requalification is required to validate the design changes as a result of the PFRT anomalies.

The first two production engines were delivered in February 1964.

4. Hybaline Fueled Engine (BAC Model 8287)

The follow-on program to establish a gas generator design which could operate for the full duration engine run was terminated when it was concluded that a complete turbine-pump-gas generator redesign would be necessary. This redesign would be required due to the heavy deposit build-up at the mixture ratio at which it was necessary to operate the gas generator.

The program to determine adverse characteristics of the Hybaline which would affect pumping the propellant was completed by the Rocket Propulsion Laboratory, Edwards Air Force Base. The program showed that there were no problems with the propellant during pumping but that handling procedures and contamination were critical.

5. Secondary Propulsion System

The Preliminary Flight Rating Test (PFRT) of the Model 8250 Secondary Propulsion System (SPS) was begun in early February. Several problems have been encountered during the PFRT which have caused a slip in the completion date to 13 August 1964.

a. Propellant valve salting. This was traced to a teflon coated aluminum gasket on which the teflon coating could be punctured permitting the salting. This problem was eliminated by replacing the aluminum with gold.

b. A Unit II (200 lb) thrust chamber had a hole burn in its side. This problem is attributed to either propellant boiling or formation of UDMH residue in an injector hole during high temperature testing. A separate program is being established to determine more definitely the cause of the burnout. PFRT status with regard to this problem will be decided after the cause and fix have been determined.

c. Leakage during cold tests. The majority of this problem is attributed to test instrumentation fittings and the rest to lax quality control during the test set up. The problem was eliminated by moving the test instrumentation outside of the cold box and tightening up the quality control.

The first two production modules were delivered to LMSC in March 1964 and were installed in a Propulsion Test Vehicle Assembly for hot firing at LMSC Santa Cruz Test Base.

6. Propulsion Test Vehicle Assembly (PTVA)

The GATV PTVA first hot firing was on 16 June 64 with both primary propulsion system (PPS) (the YLR81-BA-13) and the SPS operating. This test consisted of two SPS Unit I (16 lb) thrust chamber firings, two SPS Unit II (200 lb) thrust chamber firings and two PPS main engine firings. There will be two additional PTVA firings, one in July and one in August 1964.

A complete GATV is scheduled for hot fire in the Nov-Dec 1964 time period.

7. Propellant Feed, Load, and Pressurization System

Development efforts in the area of propellant feed, load and pressurization system is essentially complete.

One flight demonstration has been made of the single burn configuration (small helium sphere and no propellant isolation valves) with complete success.

Some minor effort still remains to be performed on the propellant isolation valves due to system considerations, but all major qualification testing is complete.

8. Electro Explosive Device Range Requirements

The test and analysis program at Franklin Institute Laboratory was completed with the conclusion that the Agena vehicle EED's could satisfactorily withstand a RF radiation environment of 100 watts per square meter.

9. .9KS500 Retro Rockets

During ground tests being conducted by NASA several of these rockets failed to fire. Investigation showed that the igniters functioned but failed to ignite the main charge. Further investigation showed variations of the igniter configuration from lot to lot and within any given lot. Firing tests showed flame pattern variations between igniters. A program was established to re-identify and manufacture the igniter configuration which was used during the rocket qualification program. This was done and a limited requalification program was conducted to demonstrate that the new igniters were acceptable for flight use.

C. ELectrical Power Subsystem (SS/C)

1. Type XIV Battery - Technical feasibility of continued development of this Zinc-Oxygen (ZOX) system has been supported by demonstrating repeatibility of cell test results. Phase II of development will include multi-cell buildup, qualification testing and development of a prototype unit to be delivered late in Fiscal Year 1965. Based on continued development success, production units should be delivered in Fiscal Year 1966.

2. Electro-Explosive Device Testing - Testing and evaluation of all standard Agena EED's for sensitivity to direct current and radio frequency stimuli has been completed. Adequate margins of safety were demonstrated in handling, installation, checkout and installed modes, providing comppliance with all range safety requirements.

3. Power Conversion Equipment - Satisfactory results of vehicle compatibility testing of the newly developed Type XII, three phase, 400 cycle inverter has led to its use as a basic Agena component. Its open Delta design, enabling maximum phase unbalance, made possible the deletion of the Type X three phase, 400 cycle inverter and the Type IA Power Amplifier. This replacement while made to increase vehicle capability also resulted in a seven pound vehicle weight decrease and a component cost decrease.

4. Electromagnetic Interference (EMI) - The EMI Test Program has been established as a continuing effort. Testing of all EMI generating and/or EMI susceptible components will continue with regular EMI Review Board Meetings being held to insure MIL STD compliance and vehicle compatibility. A portion of the cost of this program has been utilized to engage consultants from Sprague Electric Company and to provide for EMI training for LMSC design engineers. The monitoring and direction of this program will be continued under the cognizance of the Communication and Control Section.

5. Ground Test Failures - An excessive failure rate of components in non-flight operation, principally of the Type IX DC/DC power supply, required an extensive investigation of component test and systems test procedures and techniques. Implementation of resulting recommendations has sharply reduced failure rates caused by improper testing. Continued emphasis is being placed on review of test procedures and techniques, augmented by extensive and detailed failure report analysis.

6. Flight Anomalies - Emphasis on elimination of short circuits during flight, principally at the time of separation from the 1st stage booster, led to the redesign and requalification of the forward and aft safe arm junction boxes and redesign of pyrotechnic circuit logic as well as a number of using program changes. Effort to completely eliminate this problem area is continuing.

D. Guidance & Control Subsystem (SS/D)

The modification of the SS-01A vehicle to provide additional basis capability was concluded in April. In the G&C area this provided considerably more program flexibility in the use of G&C equipment, and incorporated for the first time, the improved Mod IIC horizon sensor as standard basis equipment. Equipment development was accomplished or is proceeding as follows:

a. Horizon Sensors

As a result of a flight failure of a relay which is identical to the ones used in both the Mod II A and Mod II C horizon sensors, most sensors are being reworked to replace this suspect item.

Development of the ATL Mod III H/S was terminated because of increasing costs, schedule slippage, and the loss of a requirement.

b. Velocity Meter Counter

The development including qualification and EMI testing of the Mod IIA counter was completed in June. Susceptibility to electronic noise (always a serious problem with its predecessor) has been greatly reduced. This counter will become standard basic equipment in Sept of this year.

c. Flight Control Electronics

A small transformer used in twenty-five different applications within the FCE has developed a failure mode associated with temperature cycling of the component. This problem was first discovered in production reliability testing and later in the ground test of a flight vehicle. This transformer has been redesigned to accomodate the stresses caused by temperature variations.

d. Yaw Sensor

A device capable of determing satellite yaw attitude with respect to the orbital plane was delivered to this office in April for test flight. This sensor was developed at MIT under contract with SST. This office performed the role of cognizant engineer. All arrangements have been completed for the test flight. Flight test will be accomplished when and if a vehicle becomes available.

E. Communications & Command Subsystem (SS/H)

a. Command Destruct Kit - The Command Destruct Kit is now considered fully qualified. The initial qualification testing, which was completed early in the year, was found to contain certain discrepancies both in the results of the tests and in the procedures used in the testing. The test data showed that the unit did not fully meet EMI requirements. This condition was remedied by the incorporation of three minor design changes. In the original test, the unit was not operating during the vibration tests; the vibration test was rerun. The final test results showed that the Command Destruct Kit fully met all requirements.

b. Telemetry Commutator - The motor driven commutator used in the Sampling Switch Module of the Type V Telemeter has not performed satisfactorily over a period of several months. Although there have been only a few cases of failures in flight, there have been many failures encountered in ground testing. These failures consist of excessive speed fluctuations and failures to start. Extensive testing of the motor used in the commutator have been conducted during this reporting period. Recent test data indicates that the problem may be solved by reducing brush arcing by filling the cummator with helium at two atmospheres of pressure rather than filling it with a helium-air mixture at one atmosphere.

c. Three Way Coax Switch - At the beginning of this year a program was initiated to develop a three way coax switch that will provide 90db attenuation of radiated signals. The purpose of the switch is to provide umbilical-accent antenna-orbit antenna switching for the telemeter and the tracking beacons; two separate switches are now required for this function. The program has encountered some schedule slippage due to difficulties in achieving the 90db of isolation, in heremetically sealing the unit and in subjecting the unit to 6117D levels of vibration. It now appears that these difficulties have been eliminated. The final qualification testing of the switch is scheduled to begin in the near future.

d. Gemini C&C Equipment Review - A review of equipment specifications, test plans and qualification test results for the Gemini C&C equipment was conducted in May 1964. This review was conducted on the Fly-by #1 equipment since it represented the first delivered hardware. This review revealed a general weakness in the areas of preparation of test procedures and of data recording. Because of incomplete data and of unexplained out-of-specification conditions, it was recommended that the PCM telemeter be considered not yet qualified. As a result, the telemeter has been scheduled for a partial requalification test which will start in the near future.

e. Because a special program utilizing the Standard Agena-D Vehicle has need for a Pulse Amplitude Modulation (PAM) type of telemetry module, a program was initiated. This plan includes the engineering, manufacturing and testing effort necessary to accomodate the Type VIII PAM telemeter components onto a module compatible for installation in the S-01B vehicle. The overall effort includes preparation of drawings, schematics, specifications and test procedures; reactivation and modification of necessary test equipment; fabrication of new panels, cables, brackets, and miscellaneous hardware; and evaluation, acceptance, and compatibility testing of the redesigned PAM telemetry module. The initial effort under this plan is in progress, and completion of all phases is expected within four months.

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S-01A AEROSPACE GROUND EQUIPMENT DIVISION
HISTORICAL DATA

1 Jan 1964 - 30 June 1964

1. ~~(C)~~ The conversion of PALC-1, Launch Stand 2 to an SLV-3/S-01/1172 configuration was completed under LMSC Contract AF 04(695)-354. Vehicle on Stand (VOS) capability was attained on 15 May 1964. CCN 4 to the -354 Contract, which was a credit CCN, was finalized for $720,954, cost and fee. This credit CCN combined three previous CCNs and changed the configuration of Launch Stand 2 from a 4805 vehicle to a 1172 vehicle. An additional CCN 5 to the contract, also a credit CCN, was negotiated for $9,751, cost and fee. This CCN deleted use of a Facility Checkout Vehicle (FCV) during validation of Stand 2. Total cost of this contract is $3,869,295. Authority for this conversion is SSGS secret letter, PALC-1 Complex, 29 March 1963.

2. (U) Installation and Checkout of Aerospace Ground Equipment (AGE) under LMSC Contract AF 04(695)-287 for the conversion of Eastern Test Range (ETR) Complex 14 is underway. CCN 12 to this contract, which called for Gemini peculair modifications and purchase of a Vehicle Function Generator (VFG), was negotiated for $207,409.00. Total value of this contract is $4,655,306. Authority for this conversion was SSVZO letter, Conversion of AMR Complex 14 to an Atlas Agena Configuration, 5 July 1962.

3. (U) All equipment for the Disaster Pool purchased under LMSC Contract AF 04(695)-317 has been delivered to Sacramento and is in storage at SMAMA. Complete drawings for all equipment are to be delivered by 15 July 1964. Total contract cost is $970,000, fixed fee. Authority for the procurement of Disaster Pool Aerospace Ground Equipment is SSVZO letter, Agena Items for Disaster Pool Backup, 6 June 1962.

4. (U) A Letter Contract AF 04(695)-501 for Agena launch services during CY 64 was awarded LMSC on 13 January 1964. The contractor's initial cost proposal was in the amount of $32,825,000, cost plus incentive fee (cost and performance). Several directorates and program offices assisted SSVAG in the development of performance incentive parameters for the contract and on 14 March 1964 an Air Force position was reached on the incentive plan. The procurement committee was briefed on 20 March 1964 and the negotiations with the contractor started on 31 March 1964. In early April the differences in cost and manpower were resolved, but considerable difficulty has been experienced in negotiating the incentive fee. On 30 June 1964 negotiations were still not completed; however, the estimated cost plus incentive fee will be approximately $26,800,000 when negotiated. A fund ceiling of 70% has been approved for the letter contract and $18,743,491 has been obligated to date.

[illegible]
signed by [illegible]
S. Plummer, Jr.

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5. (U) Negotiations with LMSC for the definitization of Letter Contract AF 04(695)-499 to provide Agena launch capability at the Atlantic Missile Range (AMR) were commenced 11 February 1964. The -499 Contract is a one year (CY 64) CPIF contract with both cost and performance incentive features. Prolonged negotiations were required to gain agreement on the form of the performance incentive, on the performance incentive criteria, and on the balance between the cost and performance incentives. Final agreement was reached on 27 April 1964, but the final cost of the negotiated effort could not be determined until 11 May 1964 because of rate negotiations which were independently underway 27 April 1964. As of 30 June the -499 Contract had not been definitized due to the requirement for committee and higher headquarters review. No flights were made under the performance incentive during the reporting period.

6. (U) The work statement and other supporting documents required preliminary to issuance of the RFP for the Follow-On 1965 Atlantic Missile Range and Pacific Missile Range Launch Capability Contracts were completed by this office and forwarded to SSVAK.

7. (U) During the period of this report First Lieutenants Robert N. Kehe, A03105428 and Richard J. Briones, A03097762 completed their active duty requirements and were released from extended active duty. Captain Ernest W. Rousseau, 68254A was assigned as a replacement for Lieutenant Kehe. Major Robert H. Knapp, A0793511 was reassigned to the Inspector General's Office, Hq AFSC.

8. (C) Aerospace Ground Equipment work statement evaluation, cost proposal evaluation and negotiation, technical direction of equipment development, reliability evaluation, and monitoring of design, fabrication and installation and checkout continued during the period of this report for the following programs: 162, 698BK, 206, Gemini, 461, 823, and [redacted] 50X1

9. (U) Incorporation of the provisions of AFSCM 375-1, where applicable, was applied to the AF 04(695)-129 (Gemini/Agena) Contract for Aerospace Ground Equipment. An acquisition exhibit for Aerospace Ground Equipment was also incorporated in this contract; this is the first time this has been attempted for provisioning Agena Aerospace Ground Equipment.

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PROCUREMENT & PRODUCTION DIVISION
Historical Data
1 Jan 1964 - 30 June 1964

1. The Procurement & Production Division (SSVAK) supported the Agena Space Directorate during this period by issuance of 5 new contracts and definitization and administration of an additional 21 contracts. Total value of these contracts is approximately $350,000,000.

2. During the period prolonged negotiations, which commenced on 28 Oct 63 for the definitization of L/C AF 04(695)-129 amend. 7 broke down. These negotiations were in process for five months and ended in failure on 8 April 64. On June 23 LMSC submitted a combined and complete requote for definitization of amends 7 and 11. This contract provides AF support to the Gemini Mission, a NASA and AF jointly funded program. Negotiations are scheduled to reconvene on 14 July.

3. During the period, letter contracts AF 04(695)-191 and AF-194 were definitized for the sustaining engineering support of the Agena Vehicles and for production of the vehicles. The Agena space vehicle is produced on a standard production line basis by LMSC and is furnished as GFP and modified by the using Program Agencies to conform to the peculiars of the mission being supported.

4. During the period, SSVAK issued and definitized Contract AF 04(695)-551 with Space Technology Laboratories for Guidance Equation support to the Gemini Program. Contract was CPIF (Cost only) for slightly over $1,000,000.

5. A significant accomplishment was achieved with the agreement by LMSC to include in the launch service contracts provisions for the inclusion of both cost and performance incentives. These incentives were actually negotiated into contract AF 04(695)-499 for AMR and similar performance requirements are anticipated for the definitization of L/C AF 04(695)-501 for PMR. The incentives features provide for measurement of the Agena Vehicle performance as relates to the specific program for which it is launched.

6. Fiscal year 1965 production requirements were received early enough during this period to hopefully preclude the necessity to issue a letter contract for a follow-on production contract. It is also anticipated that this 4th production buy will be made on a straight fixed price basis, as requested in the Request for Proposal.

Atch 3

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REQUIREMENTS & PROGRAMMING DIVISION
Historical Data
1 Jan 1964 - 30 Jun 1964

1. ~~(C)~~ Agena Flight Summary

On 1 March 1964, SSVA disseminated to numerous program and staff offices within SSD and Hq AFSC an Agena Flight Summary Report which described and assessed all Agena flights through 31 December 1963. During the period of 1 January 1964 to 30 June 1964, 16 Agena vehicles were flown bringing the total number of flights to 130. All but two of the 16 flights were of the current Agena D configuration. The overall success ratio of the Agena D now stands at 91%.

2. (U) Contract Overrun

On 4 June 1964, the Commander SSD approved variance funding in the amount of $890,552 on LMSC Contract AF 04(695)-21.

3. (U) Gemini Extra Care Program

The Gemini Extra Care Program was approved on 16 April 1964. The purposes of this program are to preserve the Agena Target Vehicle's inherent reliability and to improve workmanship by providing faster response to problems and their solutions.

4. (U) Launch Stand Scheduling

The first meeting of the SSV Launch Stand Scheduling Committee was held on 2 April 1964 in accordance with SSD Regulation 27-7. The Committee is made up of representatives from each of the launch vehicle and stage offices in SSV and is chaired by Lt Col Cann, SSVZ. The official SSD Launch Stand Utilization Charts are published as a result of the monthly meetings.

5. (U) LMSC Operating Schedule

LMSC Official Operating Schedule, Issue #24, was distributed to the Program Offices on 19 February 1964. The Lockheed Schedule depicts the milestones, systems test and launch stand loading for all programs using the S-01A vehicle. SSVAR acts as the SSD central point of contact for LMSC in coordinating and obtaining approval for the information presented.

Transmittal signed
by Maj Wm T. Jones

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6. (U) Personnel Changes

a. Lt John R. Straton, Jr. was assigned to the Division in January 1964.

b. Lt Curtis N. Orsborn, Jr. departed in January 1964 for SSVAT.

c. Capt George M. Sloan was assigned to the Division on 25 Apr 64.

d. Capt John A. Fiebelkorn departed in June 1964 for an AFIT assignment.

7. (U) Production Reliability Evaluation Program

During this period the Production Reliability Evaluation Program (PREP) testing continued. The purposes of this program are to insure that the quality and reliability of Agena Production hardware are maintained at the required levels and to provide data for development of improved reliability assessments. The first series of tests (Round I) was completed in May 1964. The second series of tests (Round II) continued through this period and was about 95% completed on 30 June. Round III started in March 1964 and the detailed planning for Round IV was essentially completed by 30 June 1964.

8. (U) Reliability Plan - Agena Target Vehicle

The Reliability Plan for the Gemini Agena Target Vehicle Program was approved on 28 May 1964.

9. ~~(C)~~ S-01B Production Authority

On 10 March 1964 a letter was forwarded to AFSC requesting authority for a follow-on S-01B production Contract AF 04(695)-451. Based upon using program requirements projected through 1966, authority was requested to produce 43 vehicles at a rate of three per month beginning in October 1965. Hq USAF approval was received on 22 April 1964 to procure 22 vehicles in the October 1965 through June 1966 time period.

10. ~~(C)~~ Work Statements

During this reporting period work statements were prepared and submitted to SSVAK for the following efforts:

a. S-01A/S-01B vehicle storage from July 1964 through June 1965. Work Statement issued 4 February 1964.

b. S-01B Follow-On Production of 22 vehicles; deliveries beginning in October 1965. Work Statement issued 21 May 1964.

c. S-01A/S-01B Engineering Support and Advanced Development Pr for CY 1965. Work Statement issued 29 June 1964.

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CONFIGURATION MANAGEMENT OFFICE
HISTORICAL DATA
1 Jan 1964 - 30 Jun 1964

1. GENERAL

a. Responsibility - The Configuration Management Office (CMO) is responsible to the Director, S-01 Space Project, for the implementation and administration of configuration management and control procedures in accordance with Air Force Systems Command Manual 375-1 for the production version of both the Standard Agena Vehicle (excluding AGE) and the Gemini Target Vehicle (including AGE).

b. Organization - The CMO is established as a separate division within the project directorate.

c. Personnel - Present authorization and manning is as indicated in (1) below. Additional manpower authorization shall be required as a result of the assumption of configuration management responsibility for the Gemini Target Vehicle and associated AGE as indicated in (2) below.

(1) Present:

Authorized Manning		Assigned		Title
Lt Colonel	6516	Major	6516	Chief, Configuration Mgt Office
Major	2846B	Major	2846B	Configuration Control Officer
Captain	2725	(Captain	2725*	Configuration Control Officer
		(Captain	2725**	
Captain	2816	Captain	2816	Configuration Control Officer
GS-12	2725	GS-12	2725	Specification Officer
GS-4	70250	GS-4	70250	Administrative Specialist

*Scheduled for reassignment o/a 1 Aug 64
**Scheduled for promotion to Major on 15 Jul 64

(2) Required:

Required Manning		Title
Lt Colonel	2816	Chief, Configuration Management Office
Major	2846B	Configuration Control Officer (Analysis)
Captain	2725	Configuration Control Officer (Agena Eng'g Change)
Captain	2816	Configuration Control Officer (Gemini Eng'g Change)
GS-12	2725	Specification Officer (Specs for Agena & Gemini)
(S/Sgt	70250	Administrative Specialist
(GS-3	70250	Clerk Typist/File Clerk
OR		
(GS-4	70250	Administrative Specialist
(GS-3	70250	Clerk Typist/File Clerk

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2. SPECIFIC

a. First Article Configuration Inspections - FACI's were conducted for both the Standard Agena Vehicle and for a Program Office using the Standard Agena.

(1) ABC Changes/AD-68: A FACI for the product improvements incorporated in the Agena Vehicle was performed on Vehicle AD-68 and associated optional kits. Atch 1, 13 Mar 64, presents the FACI schedule/agenda; Atch 2, 3 Apr 64, is the Optional Kit FACI Report; Atch 3, 15 May 64, is the Specification Committee Report; and Atchs 4 and 5, 1 Jun and 2 Jun 64, are the final FACI findings, including the TAB Index of Contents of the report.

(2) [redacted]/Vehicle 4807: (CONFIDENTIAL) In accordance with the provisions of agreement between SSVA and [redacted] SSVA in conjunction with representatives of Aerospace Corporation and the AFPRO/LMSC performed a FACI of the program peculiar vehicle 4807. Atch 6 is the final report, 9 Jun 64, from SSVA to [redacted]

50X1

b. Gemini Target Vehicle - The S-01 CMO has the responsibility for the configuration management program of the Gemini Target Vehicle (GTV), including AGE. Considerable effort was expended in establishing the requirements necessary for configuration control of this program. Atch 7, 20 May 64, references discussions for submittal schedules for the GTV specifications; Atch 8, Appendix A, from the 20 Apr 64 LMSC A602326 Statement of Work for the Gemini Agena Target Vehicle System, is the initially proposed Configuration Management and Control Implementation Instructions, subsequently amended by Atch 9, 15 Jun 64; Atch 10, 17 Jun 64; and Atch 11, 30 Jun 64, and still under negotiation for further amendments; Atch 12 is a first draft of the Implementation Instructions for the GTV AGE, with Atch 13, 2 Jun 64, proposed amendments thereto, and Atch 14, 10 Jun 64, additional negotiations; Atch 15, 19 Jun 64, presents an outline of specification requirements and procedures for both the Gemini Target Vehicle and its associated AGE.

c. Requirements, Policies, Procedures and Activities - Miscellaneous CMO functional activities are included in the following documentation:

(1) Atch 16, 6 Jan 64, is a request for deviation from AFSC to continue use of ANA Bulletin 391a in lieu of ANA Bulletin 445 on Contract AF 04(695)-194 until the new AFSCM 375-1 is officially published and distributed by AFSC.

(2) Atch 17, 9 Jan 64, establishes estimated release dates for drawings required for the Agena D.

(3) Atch 18, 28 Jan 64, presents CMO comments on Contract AF 04(695)-451 Cost Proposal.

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(4) Atch 19, 30 Jan 64, requests deviation from AFSC to certain items in AFSCM 375-1, as a result of negotiations with the contractor on the Implementation Instructions for Contract AF 04(695)-194.

(5) Atchs 20 and 21, 27 Mar 64, request publication of special orders for vehicle acceptance teams for the Standard Agena Vehicle and the Gemini Target Vehicle.

(6) Atch 22, 27 Apr 64, reports an AFSC presentation on the Systems Management Program being established by Hq AFSC.

(7) Atch 23, 29 Apr 64, reports on negotiations by SSD/LMSC personnel with vendor/subcontractor firms concerning configuration management of vendor items.

(8) Atch 24, 11 May 64, distributes copies of three policy and procedure documents governing the CMO's activities: (Atch 25) Configuration Management Responsibilities and Procedures for the S-01 Space Project Directorate; (Atch 26) SSVAC Standing Operating Procedure Number 2 for Processing of Engineering Change Proposals; and (Atch 27) SSVAC Standing Operating Procedure Number 3 for Processing of Specifications/Changes.

(9) Atch 28, 20 May 64, recommends engineering drawing requirements for both the AF 04(695)-194 and -451 Contracts.

(10) Atch 29, 12 May 64, presents a policy position of SSD in regard to Class II Change review and approval by AFPRO/LMSC prior to engineering release by the contractor.

d. Configuration Control Board - Atch 30, 22 May 64, requests publication of Special Orders for the S-01 Space Vehicle Configuration Control Board, as shown in Atch 31, 26 May 64.

e. Thor/Agena Booster Erection - The CMO was tasked with assisting in the planning and coordination of the installation of a combination Thor/Agena Booster/Vehicle (see Atch 32, 16 Apr 64) at the Los Angeles Air Force Station as a symbolic display of the Air Force role in space.

3. Paragraph 2a(2) is classified CONFIDENTIAL in accordance with the provisions of AFR 205-23. Attachments to this report are not classified.

[redacted] ~~CONFIDENTIAL~~ 266

12 NOV 1964

SSG

Recent Agena Flight Problems

AFSC (DMSF Maj Gen Ritland)

Attached is a resume of the briefing given to General Schriever and you on 5 November 1964. Additional inclosures are chart reproductions and supplements pertinent to the subject area.

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SIGNED
BEN I. FUNK
Major General, USAF
Commander

1 atch
Proposed letter to Sec
McMillan from Gen Schriever
w/3 atch (S)

When inclosures are withdrawn the classification of this correspondence will be downgraded to Uncl In accordance with AFR 205-1.

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Proposed letter to Sec McMillan from Gen Schriever

SUBJECT: Recent Agena Flight Problems

1. I recently reviewed the flight problems of the Standard Agena Vehicle that occurred during October. The presentation made by personnel of my Space Systems Division included the results of comprehensive investigations and analyses and corrective actions taken and proposed. The information presented indicated that appropriate, timely, and adequate action had been taken in each case, confirming my belief that our normal management system can and does react responsively to problems and failures that occur.

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2. I agreed with the AFSSD/LMSC conclusion that past Agena flight performance has demonstrated the validity of the present engineering design to achieve the required high reliability and that the current problems are primarily of a quality assurance nature. We cannot expect 100% success within current design, weight and cost limitations although this is certainly our desired goal. The Agena reliability has, in fact, been highly creditable for some time. Although I am fully aware of the cost and importance of each payload launched and its mission success, it does not seem to me that each problem or failure should be considered a major crisis. The recent Agena problems have been random in nature and, as such, require time to analyze. Undue pressure on the Program Office and the contractor for "quick fixes" tends to force hurried analyses and conclusions which may be erroneous and institution of changes which may be unnecessary or even possibly undesirable in the long view.

3. The corrective actions recommended in the three cases presented to me appear sound and adequate. In addition, Gen Funk discussed with Messrs Root and Kearton of LMSC, numerous non-design engineering efforts which Lockheed proposes to improve overall reliability. These include loan of Stan Buris from the Polaris Program to objectively examine Kearton's operations, increased personnel motivation and "zero defects" program, better vendor control, greater component parts analysis, expansion of critical items reviewed by top management and tighter acceptance standards and improved pre-launch environmental control.

4. The Air Force has continuing programs with Lockheed to determine and improve the quality of the Agena Vehicle. One of these is the Production Reliability Evaluation Program which provides functional, qualification stress and life testing of Agena production components randomly

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selected. Another is the Design Review and Failure Mode Analysis Program which identifies potential failures and determines means for their elimination.

5. In summary, I feel that the current Agena problems have been responsively and competently attacked and I am confident that they will continue to be in the future. I have attached for your information, a brief narrative summary of the presentation given to me, as well as copies of the charts used. Also attached is a summary of the Production Reliability Evaluation Program accomplishments. Recognizing your familiarity with and concern over these problem areas, I will be pleased to provide any additional information or briefing you desire.

3 atch
1. Summary of Agena Flight Problem Briefing ~~(S)~~
~~2. Briefing Charts (S)~~ SSAL-4906
~~3. Pdn Reliability Eval Pgm~~ (U)

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SUMMARY OF AGENA FLIGHT PROBLEM BRIEFING

1. Three malfunctions from separate causes occured on Agena Space Vehicles during the month of October. Extensive data reduction, engineering analysis and ground test programs were accomplished after each event to pin-point the actual failure cause. Air Force and when appropriate, Prime Contractor Teams were organized and sent to Vendor and Launch base facilities to establish the continuity and adequacy of quality control in these specific areas. This briefing summary describes the problems, their analyses, the specific corrective actions and the long term efforts to assure and up-grade the quality of the Agena Space Vehicle.

2. The first flight problem involved the premature shutdown of the Agena engine on vehicle 4810 during an Atlas-Agena boost mission. A complete and comprehensive analysis of all available flight data was accomplished and indicated conclusively that an unscheduled electrical shutdown command appeared on the engine shutdown circuit at .6 of a second after engine ignition. At 1.5 seconds after engine ignition, the engine shut down as the engine arm signal was removed. All data indicated normal performance with the single exception of this unscheduled command.

a. Ground tests were performed which verified that the failure was most probably caused by a signal short between a voltage source and the shutdown line and not a functional or system malfunction.

b. A thorough study of all possible voltage sources was made, then correlated to past vehicle history and indicated the more probable sources to be the Flight Controls J-Box, the Aft Safe/Arm J-Box, the P-4000 Connector and the Engine Harness. The Patch-Panel Connector in the Flight Controls J-Box evolved as the most suspect component. The J-Box history indicated that two small unused terminals within the box had broken off at some time during manufacturing and were never located. One of these lugs could have lodged in an open gap in this connector and shorted a 28 volt pin to the engine shutdown pin.

c. As the vehicle was in an essentially low vibration environment with no event occurring between engine ignition and the shutdown command, no exact correlation could be drawn between the unscheduled event and any of the 59 suspect voltage source points or the engine harnessing.

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d. An intensive study was made to see if a more reliable and redundant engine arm circuit could be implemented for each series of the Standard Agena. As a result of these studies, a partially redundant engine arm circuit was implemented in all remaining S-01A Vehicles; however, no satisfactory increase in mission reliability could be obtained from the circuits devised for the current versions of the S-01B Vehicles which would maintain installation and operational simplicity, be compatible with all programs and not introduce new catastrophic failure modes.

e. In conclusion, the following positive corrective action is being taken to prevent further recurrence of this specific problem:

(1) Addition of a silicon-rubber gasket to the Patch Panel Connector to protect against contamination by foreign material.

(2) Extend the duration of the engine arm signal on S-01A Vehicles.

(3) Long range upgrading of Lockheed Quality Control with emphasis in the area of junction boxes, harnesses and connectors as indicated in subsequent paragraphs.

(4) Consideration of major engine circuit simplification for down stream vehicles (Expensive).

(5) Consideration of improved environmental protection of the vehicles at the launch facility.

3. The second flight malfunction occurred after the 95th orbit of Vehicle 1170 and involved the inability of the Agena batteries to supply the necessary current at sufficient voltage. At the pre-planned point of main battery depletion and subsequent assumption of the vehicle load by the remaining pyro battery, the vehicle bus dropped 3 volts below the programmed voltage and caused the loss of payload recovery command capability.

a. Three abnormalities were discernable from the flight data. First, the unregulated bus was 3 volts low after orbit 95. Second, the internal dynamic impedance rose abnormally between orbits 65 and 95; and third, the pyro battery failed to deliver its last 170 amp-hours of capacity. Relating these facts to probable failure modes, the more plausible reason is insufficient battery electrolyte leading to local heating within cells and subsequent cell failure.

b. An investigation of vendor manufacturing procedures disclosed the fact that average electrode plate densities had increased by 2% due to more closely controlled manufacturing processes. This would allow more free electrolyte volume within each cell and would require an increased amount of the electrolyte to achieve full cell capacity. Subsequent testing established that the current quantity of electrolyte was indeed 10 cc less than that required for rated capacity.

c. Steps taken to assure future battery performance include:

(1) Battery activation with an additional 10 cc of electrolyte.

(2) Additional post-activation battery and individual cell testing at the launch facilities.

(3) Additional vendor cell testing to provide wet-stand, vibration and capacity assurance.

(4) Incorporation of tighter vendor production and document control with increased Lockheed quality assurance participation.

(5) Periodic re-training of Launch personnel and revision of activation documentation.

4. The third flight malfunction involved the failure of the guidance power converter on Vehicle 1179 after 73 orbits which resulted in an unstable vehicle and necessitated back-up capsule recovery. The flight data confirmed excessive current demands of 70 seconds duration on the unregulated DC bus and subsequent loss of regulated guidance power.

a. Integration of the excess consumed power during this critical 70 second period gave approximately 45,000 watt-seconds of available energy. Comparison of this calculation to the converter's mathematical thermal model correlated directly to the required energy to produce the converter's flight temperature profile. A 1000 micro-farad tantalum electrolytic capacitor in the converter's input audio filter has demonstrated (during an Agena Production Reliability Evaluation Program Test)

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that a possible similar failure mode exists which would duplicate the flight data.

c. Since no other type of capacitor exists which is as appropriate for this specific application, the following steps have been taken to assure converter capability:

(1) Include altitude and temperature cycling testing of tantalum capacitors at the vendor's Ultra-High Reliability facilities.

(2) Install more nearly heremetically sealed tantalum capacitors in all subsequently produced converters.

(3) Subject all previously built units to megger checks for electrical leakage.

(4) Extend current vehicle test complex investigations to incorporate reverse polarity and transient protection of conversion equipment.

(5) Increase the scope of Lockheed acceptance test procedure to include temperature testing of the converter.

(6) Initiate improved converter design to include protection of tantalum capacitors against reverse current and protection of oscillator transistors against overload.

5. In summary, the occurrence of these flight malfunctions have been determined not to be primarily of an engineering design or recurring nature. Accordingly, the major response is directed toward quality assurance efforts. Current programs in this field include the Production Reliability Evaluation Program (PREP), the Agena Design Review and Failure Mode Analysis, and the daily attention directed toward the "Top Ten" components.

a. PREP is a program that performs extensive qualification-type testing, including stress and life tests, on components selected within groups of twenty vehicles produced. Round III, which is applicable to vehicle series AD-60 through 79, has just been completed and Round IV is underway. This broad and comprehensive program has enabled many of the potential failure modes to be eliminated and greatly increased product assurance.

b. The first of two phases of the Design Review and Failure Mode Analysis for each subsystem of the Agena has just been completed. This phase established the adequacy of the existing documentation of design reviews and failure mode analyses in terms of completeness

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and applicability to SS-01B vehicle configuration as well as reviewing the historical performance of each item of equipment. Phase II will complete all outstanding action, review and analyses, and propose incorporation of appropriate modification or re-design.

c. Immediate attention to critical areas or components is implemented by a daily "Top Ten" control listing derived from ground performance. The responsible Lockheed and Air Force engineer confer on each failure or discrepancy report, monitor failure history for possible trends and take specific corrective action when appropriate.

6. As a result of the problems discussed here, additional efforts of long-term nature to be incorporated are:

a. Initiation of a "Zero-Defects" Program to achieve maximum possible reliability within design limitation and cost effectiveness.

b. Expansion of the critical component efforts to include all major subassemblies while maintaining the same inclusive responsiveness.

c. Increase Air Force and Lockheed active participation in vendor quality assurance programs, specifically to include more frequent reviews of vendor efforts.

d. Initiation of extensive contractor personnel motivation programs to include Air Force Commanders' visitations, briefings and participation in special programs.

e. In addition, serious consideration is being given to improved environmental protection of the Agena Vehicles at the launch facility. Ground tests and flight history dealing with short circuit phenomena have indicated the possibility that salt environment at the launch facility may have been partially responsible for several previous flight malfunctions.

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SSVA-1452

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HEADQUARTERS
SPACE SYSTEMS DIVISION
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
LOS ANGELES AIR FORCE STATION
Air Force Unit Post Office, Los Angeles, California 90045

REPLY TO
ATTN OF: SSG

18 NOV 1964

SUBJECT: General Dynamics/Astronautics Proposal to Increase SLV-3/Agena Payload Capability

TO: AFSC (General Schriever)

1. AFSC requested SSD to evaluate the subject proposal. The evaluation has been accomplished with the assistance of the Aerospace Corporation and the members of the Air Force Plant Representative Offices at GD/A and Rocketdyne. Summary charts depicting our evaluation of the improved SLV-3 cost and performance and a comparison relative to the T-3X are attached for your information. Briefing charts covering the details of the technical and cost evaluation will be provided General Ritland's office.

2. The GD/A proposal which we have evaluated was submitted as a cost plus incentive fee proposal. On 17 November, they officially stated that they will accept a fixed price contract if desired by the Air Force. The SSD/Aerospace team considers the technical and performance proposal to be completely feasible and incorporates changes which have been suggested during the development of the SLV-3. These changes have not been accepted since no increase in payload requirement existed for the SLV-3 and our emphasis was on the improvement in reliability. Our success in reliability is demonstrated by the successful firing of 23 consecutive LV-3/SLV-3's. Three of these were SLV-3's. Relative to cost, our evaluation demonstrates the cost as proposed to be realistic; however, SSD has added additional elements to the program beyond the proposal which we consider important to the successful accomplishment of the mission.

3. Our analysis indicates that the unit cost for a launched, improved SLV-3/Agena to be $3.62 millions on a fixed price basis and an increase in payload capability to approximately 7,000 lbs. GD/A has given us an indicated fixed price for follow-on improved SLV-3's beyond this proposal which indicates that the improved performance can be achieved at approximately the same cost of the existing SLV-3's. There are also substantial growth potentials which could further increase the capability of the SLV-3.

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4. You are familiar with the performance and cost estimates on Titan 3-X. We obviously at this time need to develop the AFSC position relative to these two boosters. I am sure AFSC recommendations will be required by DOD.

Signed

BEN I. FUNK
Major General, USAF
Commander

2 Atch
1. Performance Charts (2 pgs)(~~C~~)
2. Cost Charts (5 pgs)(U)

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PERFORMANCE

All GD/A SLV-3X Trajectory Ground Rules, Contents and Input Parameters are reasonable and conservative as verified by ASC.

Trajectories based on 100 nautical mile circular polar orbit from WTR.

SLV-3X Payload Capability	- - -	7010 ~~6931~~ lbs
T-IIIX Payload Capability	- - -	7240 ~~7130~~ lbs

Includes Radio ~~Inertial~~ Guidance System (Increased Injection Errors by Order of Magnitude)

Propellant Conditioned to 45°F at Launch

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PERFORMANCE GROWTH POTENTIAL
BEYOND THIS PROPOSAL

	APPROX P/L
Soft Shutdown Planning and Useage	123 lb
FLOX SLV-3 Configuration	
(30% FLOX = 1600 lb	4500 lb
(70% FLOX = 4500 lb	
48 In. Added Extension to SLV-3X	500 lb
H-1 Engines with Optimized Tanks	Not Established

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SLV-3X TOTAL COSTS
CONTRACTOR PROPOSALS

	DEVELOPMENT (NON-RECURRING)	PRODUCTION	LAUNCH SERVICES	SYSTEM INTEGRATION
GENERAL DYNAMICS	$7,478,315	$51,759,903	$12,613,879	$2,891,750
ROCKETDYNE	6,942,011	12,742,152	2,237,806	*
GENERAL ELECTRIC	NEGLIGIBLE	3,000,000	6,930,000	
ACOUSTICA	150,000	720,000	672,000	
BURROUGHS	NEGLIGIBLE		720,000	
LMSC	300,000			
TOTAL	$14,870,326	$48,222,055	$23,173,685	$2,891,750
			GRAND TOTAL	$89,157,816

NOTES: *1. ROCKETDYNE PROPOSAL INCLUDES SYSTEM INTEGRATION TO COMPLETION OF DEVELOPMENT

2. ALL COST FIGURES INCLUDE FEE

3. PROPOSAL INCLUDES SLV-3X ACTIVATION AND LAUNCH OF 24 VEHICLES FROM WTR, PALC-2, PADS 3 AND 4

4. PERIOD OF PERFORMANCE - 1 DEC 1964 - 31 AUG 1967

AEROSPACE CORPORATION

REALISTICALLY REQUIRED ADDITIONAL PROGRAM COSTS

NOT INCLUDED IN PROPOSAL

GENERAL DYNAMICS - ASTRONAUTICS		
FIRST ARTICLE CONFIGURATION INSPECTION		$1,090,000
ADDITIONAL TELEMETRY & DATA REDUCTION - 3 ARTICLES		800,000
EXPANDED UTP AND RELIABILITY PROGRAM		300,000
BOLT, BERANEK & NEWMAN INC. SUPPORT - CAPTIVE FIRING		100,000
SPARES & ECP'S FOR 24 VEHICLES (@ $250,000)		6,000,000
PAD "BURN OFF" REFURBISHMENT KITS (24 LAUNCHES)		1,308,000
SUB - SUBTOTAL		9,598,000
CREDIT FOR SYSTEMS INTEGRATION OVERQUOTE		- 1,060,550
SUBTOTAL		8,537,450
ROCKETDYNE		
PROPELLANTS — DEVELOPMENT	$450,000	
PROD. TEST	200,000	
LOGISTICS	20,000	
		$ 670,000
ENGINEERING CHANGES		180,000
SPARES		250,000
ENGINE & COMPONENT OVERHAUL & REPAIR		330,000
RELAY BOX MODS - REDUNDANT CIRCUITRY		100,000
SMALL LINE FREEZING PROTECTION		100,000
SUBTOTAL		$1,630,000
LMSC		
COMPLETE REDESIGN OF ADAPTER SECTION AND ADDITION OF NECESSARY ATTACHMENTS ABOVE PROPOSAL ESTIMATE		$ 1,200,000
TOTAL REALISTIC COST ADDITION		$11,367,450

NOTES: 1. ALL ESTIMATES INCLUDE FEE 2. DOLLAR ESTIMATES BASED ON PAST EXPERIENCE

AEROSPACE CORPORATION

SLV-3X PROPOSAL EVALUATION CONCLUSIONS

1. THE COMPLETE SLV-3X PROPOSAL IS FEASIBLE
2. THE PROPOSED SCHEDULE IS REASONABLE
3. COSTS:

A. THE TOTAL PROPOSAL COST IS	$89,157,816
B. THE TOTAL ADDITIONAL COST AS DETERMINED BY AIR FORCE/AEROSPACE EVALUATION TEAM IS	*$11,367,450
C. THE TOTAL REALISTIC COST TO COMPLETE THIS PROGRAM INCLUDING ALL CONTINGENCIES IS	$100,525,266

*NOTE: COST FOR TASKS EXCLUDED BY GD/A & ROCKETDYNE GROUND RULES

SLV-3X TOTAL COSTS
CONTRACTOR PROPOSALS

	DEVELOPMENT (NON-RECURRING)	PRODUCTION	LAUNCH SERVICES	SYSTEM INTEGRATION
GENERAL DYNAMICS	$7,478,315	$31,759,903	$12,613,879	$2,891,750
ROCKETDYNE	6,942,011	12,742,152	2,237,806	*
GENERAL ELECTRIC	NEGLIGIBLE	3,000,000	6,930,000	
ACOUSTICA	150,000	720,000	672,000	
BURROUGHS	NEGLIGIBLE		720,000	
LMSC	300,000			
TOTAL	$14,870,326	$48,222,055	$23,173,685	$2,891,750
			GRAND TOTAL	$89,157,816

NOTES:
*1. ROCKETDYNE PROPOSAL INCLUDES SYSTEM INTEGRATION TO COMPLETION OF DEVELOPMENT
2. ALL COST FIGURES INCLUDE FEE
3. PROPOSAL INCLUDES SLV-3X ACTIVATION AND LAUNCH OF 24 VEHICLES FROM WTR, PALC-2, PADS 3 AND 4.
4. PERIOD OF PERFORMANCE - 1 DEC 1964 - 31 AUG 1967

SUMMARY COST COMPARISON

	T-3X	SLV-3X	SAVINGS
Non Recurring	$74,230,000	$18,930,326	$55,299,674
Recurring	155,250,000 (for 23 launched vehicles)	125,274,940 (for 24 launched vehicles)	29,975,060
Total Program	229,480,000	144,205,266	85,274,734
UNIT Vehicle Launched Cost (Excluding Agena)	4.97 (FP)	3.40 (CPIF)	1.57
UNIT Vehicle Launched Cost (Fixed Price) (LSV-3X Conversion) (to Fixed Price) (Contract)	4.97 (FP)	*3.62 (FP)	1.35

*SLV-3X Recurring Cost (Fixed Price)

$\$81{,}594{,}940 + 5{,}256{,}000 = \frac{86{,}850{,}940}{24} = \$3.62$

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268

SSGA 10 December 1964

MEMORANDUM FOR GENERAL FUNK
GENERAL COOPER
(In Turn)

SUBJECT: Request for Authority to Raise Major Agena Subcontractors to Associate Status

1. The latest proposal from SSV concerning the Agena (Tab A) recommends that four major Agena subcontractors be raised to associate status. The previous recommendation made on 3 September 1963 was restricted to recommending that we buy the Agena engines directly from the Bell Aerosystems Company. This was rejected by Gen Cody by letter to SSV dated 19 September 1963 (Tab B) for the following reasons:

a. Possibility of effecting technical performance by procurement management realignment.

b. No assurance SSV can continue to retain capability to effectively manage technical and procurement aspects of the direct approach.

c. Purported cost savings are too nebulous to provide a firm basis for decision.

d. Complications of arriving at a new agreement with NASA.

2. Prior to Gen Cody's letter, the LMSC had been asked to comment on the SSD proposal to furnish BAC 8096 Engine GFE to LMSC which they did on 26 August 1963 (Tab C). Gist of the Lockheed counter against this proposal is as follows:

a. The 8096 Engine Configuration is not Stabilized. Frequent changes on engine configuration require a system of close technical control and coordination not possible under GFE as evidenced by C&C equipment that is GFE.

COMMENT: The changes in engine configuration are no longer frequent; however, in any case, Lockheed would still have the SE/TD responsibility which would require them to exercise the close technical

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control, therefore, the technical people would be the same. The only Lockheed responsibility that would be reduced would be the procurement function. Technical control would not be involved in any case. In the event that the Air Force did take over procurement of the engine, the AFPRO at Bell would fully support and he is prepared to make a development engineer available on a full-time basis. Bell support is available at LMSC and would continue. With regard to the reference of the C&C equipment that is GFE, it should be pointed out that the C&C is furnished by an office other than the Agena office.

b. Present Subcontract System Highly Successful. GFE interfacing would delay response time to problems and changes, reduce design, test and manufacturing information available to LMSC; and reduce LMSC control over BAC. LMSC could not assume responsibility for satisfactory performance of the GFE engine.

COMMENT: In this case, going direct from the Air Force to Bell might, in fact, eliminate a step since Lockheed has to have its subcontracts approved by the AFPRO. It is true that if the engine becomes GFE we do assume the responsibility. The LMSC SE/TD responsibility would be extended to the GFE engines after acceptance by LMSC. We see no problem. In previous cases where we have substituted GFE engines in the Lockheed production line, no problems have arisen.

c. LMSC History of Progressively Lower Engine Costs. Since 1959 LMSC has brought unit price of 8096 engine from $245,000 to $127,000.

COMMENT: The last buy on a Bell engine was for $141,000. It is felt that the Air Force management team -- to include the AFPRO -- has contributed as much to the reduction in engine cost as has any other factor. There is every reason to believe that the Air Force could do as good a job or better than Lockheed in reducing engine cost. There has been a normal reduction under conditions of repetitive production contracts. Costs will not increase under Air Force procurement.

d. Warranty Cost and Risks. While Bell has insisted on warranty risk coverage of $12,000, $5,000, and $6,000 per engine on various contracts, LMSC has assumed all warranty risk coverage or obtained agreement from Bell to cover part at no cost from Bell and assumed the remainder themselves.

COMMENT: It is Air Force policy not to pay extra for a warranty. We buy to a specification. Every charge on the maintenance contract is

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already charged to the government as well as is the charge for the technical monitorship entailed.

e. Cost Savings through Negotiation and Administration. LMSC's effective management has resulted in cost savings which more than offset the fee received by LMSC.

COMMENT: There is no reason to believe that Lockheed can buy any engines any cheaper from Bell than we can. Had Bell run into extensive problems with the engine, there would not be the cost savings which Lockheed has credited to negotiation and administration. The improvements or development changes have been charged to the LMSC development contracts, not production.

f. Manpower. Success has come about by cooperative participation of a large number of LMSC personnel, a great deal of which Air Force would have to be prepared to provide.

COMMENT: The Lockheed personnel who would be affected by GFE procurement of Bell engines are procurement people. Lockheed would still be responsible for SE/TD. These functions which Lockheed would drop would be picked up partly by the AFPRO and partly by the SSV office. There would be no effect on Lockheed systems people. The additional cost to the government would be approximately $50,000 in TDY funds over a two-year period plus two spaces for additional engineers in SSV.

g. Repairs and Replacement Parts. Components are constantly being sent back to Bell for repair. This procedure requires coordination and creates an additional administrative burden. If Air Force assumed this responsibility, the remedial reaction time required to support manufacturing schedules may be hampered.

COMMENT: Repairs to Bell engines have been relatively insignificant. If major overhaul is required, the engine has to be shipped back to Bell for replacement. Whether the engine is procured by the government or by Lockheed, the government pays for the repairs. It is difficult to see that reaction time would be any less under the government than under Lockheed.

h. NASA Interface. Air Force would have to effect agreement with NASA by which NASA engines would also be GFE. Otherwise, the Air Force would be faced with possibility of opening separate contracts with Bell, thereby increasing the unit cost of engines as a result of duplicate setup, costs, etc.

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COMMENT: Lockheed's position is not considered valid since NASA has asked the Air Force to provide delivered Agena vehicles complete. Therefore, it would make no difference to NASA whether the engines were GFE or Lockheed procured. All Agena requirements are consolidated and Agenas are not assigned to a program until approximately three to four months before delivery.

i. Delivery Schedule. Delivery requirements of two types of engines can be more effectively monitored from a single point.

COMMENT: Government procurement would also provide for monitorship from a single point.

j. Effect on Prime Contract Incentive Fee. Air Force would have full responsibility and LMSC would be entitled to relief on prime contracts in area of performance or delivery incentives for any inadequacies in the engines or late deliveries to Lockheed.

COMMENT: There is no reason that GFE engines should degrade the Agena vehicle. Lockheed would still have full responsibility for Agena performance and delivery incentives except insofar as late delivery of a GFE engine is concerned. We have no problem with Bell deliveries; they are not operating to capacity.

3. Discussion:

a. The SSV letter requested approval of all major Agena subcontractors to associate status. Such an approach is being and has been successfully pursued in the case of other programs. While the Lockheed Agena program has been highly successful, experience has proven that it can be just as successful using the associate contractor approach. The associate contractor approach, by decreasing multiple fees, would provide savings to the government. It would be in furtherance of the massive DOD cost reduction effort. In addition, we know that the GAO has been looking into the Lockheed situation. From both the point of view of higher headquarters' direction and possible GAO criticism, we would be responsive by adopting the associate contractor approach. There would also be an additional bonus from the point of view of SSD. In general, SSV feels that Lockheed has a tendency to be somewhat arbitrary and highhanded. The associate contractor approach will provide for tighter control over Lockheed by narrowing their sphere of effort.

b. With regard to cost savings, if the four major Agena subcontractors were raised to associate status, the savings would be $37,655 per vehicle or

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$1,317,986 total for the 35 vehicles. This can be compared with the cost to the government to achieve this which is estimated to be $100,000 in TDY funds over a two-year period plus four manpower spaces for additional engineers in SSV. If only the engines are made GFE, the savings would be approximately $19,000 per vehicle or $665,000 for the 35 vehicles. The cost to the government is estimated to be $50,000 in TDY funds for a two-year period and manpower spaces for two additional engineers.

c. Were the Agena only for SSD and NASA projects, there would be no question but that the associate contractor program should be instituted at the earliest, however, the majority of Agena vehicles are procured for SAFSP. In view of the success of the Agena program, SAFSP may be unwilling to see anything done to the Agena program which has the potential for creating perturbations in the program. This risk can be minimized, but it does exist. In this connection, it should be pointed out that Lockheed has as much to lose as SSD, and that they will therefore do everything they can to insure that the new system works.

4. Recommendation:

That approval be given to proceed with the new contract specifying that the BAC engines will be provided as GFE. Limiting the associate contractor status to Bell only at this time will permit the SSV program office to concentrate their effort on Bell and also stop the Lockheed fee on the highest cost subcontractor item. Phase-in of other associates can occur at a later date. The above recommendation is predicated on obtaining the concurrence of SAFSP. I understand that SSV must soon go forward to Lockheed to increase the buy from 22 to 57 vehicles. In order that they may proceed, an early decision is required.

SIGNED

J. L. HAMILTON
Colonel, USAF
Asst for Staff Support

3 Atchs
1. Tab A (IOC, SSV to SSG 25Nov64 w/atch)(Conf)
2. Tab B (IOC, SSGA to SSV 19Sep63)(U)
3. Tab C (LMSC ltr to SSVA 26Aug63 w/atchs) (U)

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Agena

HEADQUARTERS
SPACE SYSTEMS DIVISION
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
Air Force Unit Post Office, Los Angeles, California 90045

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REM

REPLY TO
ATTN OF: SSK

SUBJECT: Request for Determination and Findings Pursuant to AFPI 3-214

25 JAN 1965

TO:

AFSC (SCK-3)
Andrews AFB
Wash DC 20331

Hq USAF (AFSPP-CA)
Wash DC 20330

IN TURN

1. (U) A Secretarial Determination and Findings is requested authorizing the negotiation of contracts pursuant to Title 10 U.S. Code, Section 2304(a)(14).

2. (~~C~~) The proposed procurement is set forth below, in accordance with the format and requirements of the Armed Services Procurement Regulation.

Category 1 - Legal Sufficiency

a. The procurements contemplated by this request are as follows:

(1) The YLR 81-BA-11 and YLR 81-BA-13 Rocket Engine, both models utilized by the 201 Agena Space Vehicle, hereinafter collectively referred to as the 801 Primary Propulsion Engine, will be produced at the rate of four (4) per month. A contract was awarded in FY 62 for long leadtime materials necessary to achieve this rate of production, beginning in FY 63. Followon contracts were awarded in FY 63, 64 and 65 for long leadtime items required for additional 801 engines. The proposed FY 65 procurement will likewise provide for long leadtime materials to permit continuous production into FY 66.

(2) Optional equipment to be used by a number of satellite programs will depend on their individual mission. The design, qualifications, and initial buy of optional equipments were made in FY 62. The FY 65 requirement will include the optionals determined necessary to accompany engines delivered in FY 66.

(3) Spare parts and technical support for engines procured and delivered in FY 66. The spares contemplated will support the engines delivered in that period, most of which are peculiar to the 801 and are not of a type which can be obtained in the open market.

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(4) Component Improvement Program, including studies and design, which are to be procured on a rate-of-effort basis. A similar program was obtained in FYs 63-65 with requirements generated from the results of flight tests and other sources. The end purpose of the component improvement program is to maintain and improve the quality and reliability of the 801 Primary Propulsion Engine in order to satisfy the requirements of the user satellite programs.

b. The 801 Primary Propulsion Engine is an integral part of the 801 Agena Satellite Vehicle. This satellite vehicle performs its ascent and orbital mission within a space environment which demands an exceptional degree of component reliability, and the ability of all components to operate effectively with a number of satellite systems and associated ground equipment. It must satisfy the requirements of both an upper stage boost vehicle, and the more complex requirements of an orbital satellite with recovery capability. The 801 must further be adaptable to the mission requirements of a number of satellite programs, and must therefore be designed with regard to an interface between both the Thor and Atlas missiles as a first stage; and the various satellite program payload. It is a basic ascent and orbital vehicle for programs sponsored by not only the Air Force, but also the NASA, Army, and ARPA.

c. The procurement for FY 65 is estimated as follows:

Engines	$5,100,000
Spares and Spares Repair	250,000
Engineering Support	300,000
Technical Support	350,000
	$6,000,000

d. Both the Government and the Contractor have made a substantial initial investment in the capability of the Bell Aerosystems Company to produce these engines. This initial investment is a part of the basis which precludes advertisement of this requirement on the open market.

(1) The Government has made a substantial investment toward acquiring the capability to create the 801 Primary Propulsion Engine, both in the form of subcontracts for research and development, and in the form of Government-furnished industrial facilities and specialized tooling and test equipment. To date, the Government has provided Bell Aerosystems Company approximately $3.3M of industrial facilities, practically all of which will be used to produce the engine. Therefore, it would not be feasible to transfer the facilities to some other company. In addition, the Government has an investment of approximately $1.5M in tooling, special test equipment and checkout equipment which likewise could not be transferred to any other contractor.

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(2) The amounts indicated above were determined by reference to industrial facilities contracts and estimates of special tooling and test equipment from various subcontracts related to the Air Force satellite programs with BAC. The Contractor's contribution was obtained from the contractor on an informal basis.

e. Duplication of an extended period of preparation.

(1) The major categories of work required to prepare for production by any other contractor than Bell Aerosystems Company would include the creation of considerable production facilities of exceptionally complex equipment for the reliability required. It would include design and fabrication of tooling according to the production methods of any company which might be selected; it would include the recruitment and training of production engineers, technicians, manufacturing personnel, quality control personnel, etc. Obviously, this would also include the requirement for suitable types of management.

(2) Assuming that an otherwise qualified producer could be found, and that he could devise production methods and obtain production equipment as well as tooling, it would be necessary that a prototype be fabricated and tested prior to commencement of production. Experience has shown that components, when combined as a system, may function perfectly under ground test conditions, but fail in flight under environmental conditions found in space. Simple prudence would therefore require that one or more prototypes be flown with extensive telemetry instrumentation to diagnose the effectiveness of the system and to identify the cause of failures. In short, the cost of obtaining confidence in a new supplier's product would amount to a development program.

(3) In view of the importance of competitive procurement, a study was made by the Air Force for the purpose of ascertaining the time required for another contractor to produce this vehicle. This study revealed that a minimum of 24 months preparation time would be necessary providing no unusual technical difficulties were encountered. This study also assumed that adequate manufacturing information and data could be obtained from the Bell Aerosystems Company.

Category 2 - History of Previous Procurement

a. The present producer Bell Aerosystems Company was selected as a subcontractor by Lockheed Missiles and Space Company in accordance with established procedures.

b. Any decision to establish competitive sources must recognize not only the duplicated cost to the Government, but more importantly, the effect of the time delay involved in preparation before any production

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could be expected. The state-of-the-art in the space field advances so rapidly that any design which is committed to production today will bear small resemblance to the design requirements of three years hence. The advancement of science and technology concerned with space activity over the past five years is a matter of common knowledge. A delay approximating two or three years would ultimately affect the interests of this country.

c. The foregoing information obviously applies to any plan to split the current procurement into quantities which would permit obtaining a second source. Further, the urgent program schedule demands absolute adherence to consistent and uninterrupted delivery dates. Experimentation with an inexperienced source or sources could result in a need for rescheduling the entire program.

d. It is anticipated that the production engines of the program will continue to be procured on a fixed price basis. A delivery rate of 4 engines per month beginning in October 1963 and continuing through June 1964 and a final delivery of 3 engines in July 1964 establishes a total requirement of 39 engines for this contract. The engine delivery schedule is integrated with requirements of all production contracts for the cited period. On the basis of an additional 8-month delivery lead time, the following procurement plan is proposed:

1 Feb 1963	Complete Work Statement
20 Feb 1963	D&F Approval
21 Feb 1963	Issue RFP
1 Mar 1963	Issue Letter Contract (To cover work initiated in October 1962)
20 Mar 1963	Receive Contractor's Proposal
23 Apr 1963	AFPRO Cost Analysis Complete
11 May 1963	Staff briefing and negotiation plan complete
20 May 1963	Negotiation complete
17 Jun 1963	Contract writing and internal review complete
28 Jun 1963	Contractor signature
15 Jul 1963	Procurement committee approval
1 Aug 1963	Distribution

e. Procurement Background

(1) The Bell Aerosystems Company developed the 8001 Primary Propulsion Engine under several subcontracts with Lockheed Missiles and Space Company, the first of which was awarded in the last quarter of 1956.

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3. Extra contracting with Bell Aerosystems Company to replace the existing [illegible] will result in a net saving of approximately $772,[illegible] over a delivery period of 20 months commencing October 19[illegible] and involving 19 engines. These direct dollar savings will result from eliminating [illegible] profits and [illegible] a substantial portion of Lockheed Missiles and Space Company burden charges.

4. This letter is classified Confidential [illegible] to protect the estimated [illegible] delivery rate during FY 6[illegible].

SIGNED
BEN I. FUNK
Major General, USAF
Commander

1 Atch
[illegible]

~~CONFIDENTIAL~~

DEPARTMENT OF THE AIR FORCE

DETERMINATIONS AND FINDINGS

AUTHORITY TO NEGOTIATE CONTRACTS

1. This procurement will consist of one or more contracts for the YLR 81-BA-11 and YLR 81-BA-13 Rocket Engine, both models utilized by the SO1 Agena Space Vehicle, hereafter referred to collectively as the SO1 Primary Propulsion Engines; Optional Equipment necessary to accompany engines, Improvement Studies and Design; Initial Spare Parts, and Technical Support for SO1 Primary Propulsion Engines.

2. The authority herein granted to negotiate for spare parts is limited to those spare parts which are determined, not later than 90 days prior to the scheduled acceptance of the last article under contract, to be necessary to support the end item being procured under authority of this determination and findings and are not identical to parts previously procured by the Air Force on other than the contracts to which this determination and finding is applicable.

3. The SO1 Primary Propulsion Engine is designed to become an integral part of the SO1 Agena Space Vehicle which performs ascent and orbital missions within a space environment demanding an exceptional degree of component reliability and the ability of all components to operate effectively with a number of satellite systems. Both the Government and the Bell Aerosystems Company have made substantial investments to achieve the capability to produce the SO1. The Government has invested approximately $4.8M for industrial facilities, special tooling and test equipment, and checkout complexes. The Contractor has invested approximately $29.2M for industrial facilities; independent research; and the training of personnel. The Government would have to duplicate its investment of approximately $4.8M if this procurement were to be made from another source other than the one which is presently producing the items. Also, it would not be feasible or practical to furnish a new supplier with duplicate Government-furnished property, in that present producer is using all Government-furnished parts in performing on existing subcontracts that will not be completed until calendar year 1966. All of this investment is an essential contribution to the capability of producing SO1 Primary Propulsion Engines. The present supplier has achieved the know-how and capability to produce this highly complex satellite engine over a period of approximately seven years. Of this time, another supplier would require at least 24 months of preparation time before the first prototype could be produced.

4. Based on the findings above made, I hereby determine that the proposed procurement is for technical and special property requiring a substantial initial investment and an extended period of preparation for manufacture, and that formal advertising would be likely to result in additional cost to the Government by reason of duplication of investment, and may require duplication of preparation already made which would unduly delay procurement.

5. Upon the basis of the determinations and findings above, I hereby authorize the negotiation of a contract for this procurement pursuant to 10 U.S.C. 2304(a)(14).

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See SL-V-4
see MOL case file
& historical reports

HEADQUARTERS
SPACE SYSTEMS DIVISION
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
LOS ANGELES AIR FORCE STATION
Air Force Unit Post Office, Los Angeles, California 90045

REPLY TO ATTN OF: SSVA

FEB 5 - 1965

SUBJECT: Historical Report, 1 July 1964 - 31 December 1964

TO: SSEH

1. (U) The Agena Directorate is responsible for the management and technical direction of contractor efforts for the definition, design, production, modification, storage, logistic support, test and launch support of the Agena vehicle for all using programs. This includes certain engineering and procurement support to specified programs. The Directorate provides Aerospace Ground Equipment engineering support and facilities activation for all using programs and is responsible for the management and direction of the Agena launch services contracts for the Eastern and Western Test Ranges. The Directorate is also responsible for all program functions for the acquisition and launch of the Gemini Agena Target Vehicle. On 1 September 1964, Col William C. Nielsen was assigned as Director, due to the pending retirement of Col Edward F. Blum. Those personnel assignments specified in the previous report have been in effect throughout this period. In accordance with direction from the Deputy for Launch Vehicles, this Directorate established a Burner II Task Group, headed by Lt Col J. G. Goppert. This Group functions as a provisional staff office in anticipation of the mission responsibility being assigned to the Directorate when Phase II of the Program receives final approval.

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2. ~~(C)~~ During this reporting period, 24 Agena vehicles (21 Agena D's) were flown, bringing the total to 154 flights. The overall success ratio of the Agena D now stands at 91%. Round IV of Production Reliability Evaluation Program testing was initiated during this period and planning for Round V is essentially completed. See atch #1.

3. (U) Four new contracts were issued during this period and four letter contracts were definitized. These, along with 38 active contracts, total approximately $400,000,000. A request was submitted for procurement of additional vehicles extending through December 1966, and approval was received for even more vehicles than requested (see atch #1). Letter Contract AF 04(695)-129, Amendment 7 and 11 was definitized as Contract AF 04(695)-545 for the Gemini Agena Target Vehicle Program, and additionally an Amendment was issued to incorporate Aerospace Corp technical support into this Program. The status of all Launch Services Contracts is covered in atchs #2 and #4. A compromise settlement of fee for CCN 33 to Contract AF 04(695)-194 was reached after some months of negotiation.

DOWNGRADED AT 3 YEAR INTERVALS;
DECLASSIFIED AFTER 12 YEARS.
DOD DIR 5200.10

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4. (U) In the engineering area, this Directorate continually has an abundance of activity, particularly in view of having a self-contained "Blue-Suit" capability. The propulsion subsystem has continued its highly reliable performance. During this period, testing has continued on both the engine modification providing multi-start capability and the Secondary Propulsion System; two S-01B restart missions were flown with successful restart achieved. Separation Joint redesign was studied during this period and a Zip-Cord Separation Joint is still under evaluation, however, the present design is not being subjected to a crash change program. Increased thermal control, minor design modifications and increased surveillance of quality assurance were installed in order to assure higher reliability of the primary flight batteries. The Mod IIC Horizon Sensor was flight tested during this period and should provide significant improvement in performance and reliability. An Integrated Guidance Module has been proposed by LMSC and is under consideration at this time. The MIT Instrumentation Laboratory was contracted to study the stability aspects of the Gemini Agena Target Vehicle. Significant improvements have been made in the telemetry system during this period. Another accomplishment toward increasing Agena reliability was the completion of electromagnetic interference testing of practically all electronic equipment used on the Agena vehicle. A problem area exists in the Gemini Agena Target Vehicle Command & Control System, particularly in the Command Programmer; extensive management engineering effort is being conducted in this area. See atch #3.

5. (U) Negotiations for Launch Capability Contract (LCC) AF 04(695)-501 were completed in July 1964 and during this period 19 vehicles were launched under this contract, 16 of which were covered by the performance incentive criteria. Five flights were conducted under the performance incentive features of Launch Capability Contract AF 04(695)-499. All equipment and drawings for the Disaster Pool have been delivered to SMAMA. Eastern Test Range Complex 14 was converted to an Agena D configuration (completed during this period) and Vehicle on Stand Capability was attained on 31 December 1964. See atch #4.

6. (U) During this period, the Proposed Mission Plan for First Agena Rendezvous Flight (Gemini Atlas Agena Target Vehicle) was altered twice. In October 1964 the Gemini Agena Program Office requested from NASA/MSC their best estimate of the NASA mission plan, ultimately relating to mission flexibility. Since the eighth vehicle was terminated from this program in December 1964, it is now based upon seven vehicles, six launches. The Target Vehicle launch schedule was redirected by NASA in August 1964, slipping the first rendezvous mission by six months, thus correcting a discrepancy between the Target Vehicle and the Gemini Launch Vehicle/Spacecraft launch dates. Further information on this Program's activity and Program Milestones is contained in atch #5.

7. (U) During the period of this report, the Uniform Specification Program for the Gemini Agena Target Vehicle Program was established. A major feature of this was the decision to place Aerospace Ground Equipment under configuration management. Another Uniform Specification Program was established incorporating the new AFSCM 375-1 on contract for a new program.

Air Force/LMSC Configuration Management pipeline meetings were established during this period in order to improve the LMSC configuration management effort.

8. U)This Directorate participated in a study involving the Titan III X/Standard Agena and a work statement was issued in August 1964. Another study, this on Improvement of the Standard Agena, resulted from an inquiry by Dr Hall, DDR&E. This study, prepared by Lt Col R. K. Le Beck, was completed in December 1964 and prepared for presentation to Hq AFSC, Hq USAF, SAF, and Dr Hall in early January 1965. Also during the period of this report, the Agena Directorate proposed that major subcontractors to LMSC, involved in the production of Agena vehicles, be elevated to associate contractor status. It was subsequently recommended to limit this consideration to Bell Aerospace Corp. At the end of this period, the final decision had not been reached by the Deputy for Launch Vehicles.

9. (U) Refer to all attachments for the individual reports of this Directorate's Divisions as no attempt is made in this letter to cover in detail all aspects of our activity.

William C. Nielsen

WILLIAM C. NIELSEN
Colonel, USAF
Director, Agena

6 Atch:
Historical Data
1. Requirements & Programs Division (Ø)
2. Procurement Division
3. Vehicle Engineering Division
4. Agena Ground Equipment Division
5. Gemini Agena Division
6. Configuration Management Division

Cy to: SSV (no atch)

filed in Gemini Target file

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SSVAR

Requirements and Programming Division
Historical Data
1 July 1964 - 31 December 1964

1. (~~C~~) Agena Flight Summary

On 1 October 1964, SSVA distributed the Agena Flight Summary Report to program and staff offices within SSD and to Hq AFSC. This report described and assessed all Agena flights through 30 June 1964. During the period 1 July 1964 to 31 December 1964, 24 ~~21~~ Agena vehicles were flown making a total of 154 flights. Of these ~~21~~ 24 flights, ~~18~~ 21 were of the current Agena D configuration. The overall success ratio of the Agena D now stands at 91%.

2. (U) Production Reliability Evaluation Program

During this period the Production Reliability Evaluation Program (PREP) testing continued. The second series of tests (Round II) was completed in August 1964. PREP Round III was approximately 92% completed on 31 December 1964. Round IV was started in August 1964 and was approximately 67% completed by 31 December. Detail planning for PREP Round V was essentially completed on 31 December 1964.

3. (U) Reliability and Quality Programs - Agena Target Vehicles

During this period the Reliability section of SSVAR effected a 2.5 million dollar withholding on Contract AF 04(695)-545. This action was necessary due to the contractor's laxity in meeting the schedule for Reliability documentation. The contractor made several changes in management personnel and the schedule was subsequently met.

4. ~~(C)~~ Agena Production Authority

On 18 September 1964 SSVAR submitted to AFSC an Agena D requirements and delivery schedule calling for 8 additional vehicles. These 8 vehicles were in addition to the 22 vehicles previously approved for the period Oct 1965 through June 1966. In addition, SSVAR requested that approval for procurement be extended beyond June 1966 through December 1966 at the rate of 3 1/2 veh. per month. A total of 51 vehicles would have been procured under this proposal.

On 10 December 1964, AFRPA 96778 TWX authorized a new and revised production schedule and follow-on procurement action for a total of 57 Agena D vehicles, 6 more than requested. The first 22 vehicles had been previously authorized by AFRDD 71625 TWX,

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dated 22 April 1964, and the remaining 35 vehicles constituted new procurement authority to extend through Dec 1966. The revised delivery schedule, including the total follow-on procurement is as follows:

	CY 65						CY 66											
	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
On Contract	3	3	3	2														
New Authority				2	3	4	4	4	4	4	4	4	4	4	4	4	4	4
Delivery	3	3	3	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4

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5. ~~(C)~~ Work Statements

During this period work statements were prepared and submitted to SSVAK for the following efforts:

a. Agena Guidance and Control System. Technical Support - issued 16 November 1964 (No contract period given)

b. Titan IIIX/Standard Agena Study, 17 August through 1 October 1964. Work Statement issued 17 August 1964.

SSVAK

Procurement & Production Division
Historical Data
1 July 1964 to 31 December 1964

1. The Procurement & Production Division (SSVAK) supported the Agena Space Directorate during this period by issuance of four (4) new contracts, definitization of four (4) letter contracts and administration of thirty-eight (38) active contracts. Total value of these contracts is approximately $400,000,000.

2. During the period, Letter Contract AF 04(695)-129, Amendment 7 and 11 was definitized as Contract AF 04(695)-545; Definitive Contract amount was $50,289,000. This contract provides AF support to the Gemini Program by development and delivery of the Gemini Target vehicles. It is a Air Force and NASA jointly funded program. Also, during the period, Amendment No. 27 to Letter Contract was issued to incorporate Aerospace Corporation technical support to the Gemini Program Office. As yet, no cost has been negotiated for this effort.

3. During the period, negotiations were completed for launch services by Lockheed Missiles & Space Company at WTR. Letter Contract AF 04(695)-737 will be issued effective 1 January 1965 to cover services at both ETR and WTR. The issuance of the Letter Contract to cover WTR which has been negotiated, is necessary to fund the effort in that the definitive contract could not be processed by 1 January 1965, the date for commencement of the Launch Services. Period of Performance at WTR is from 1 January 1965 to April 1966, ETR Period of Performance is for Calendar Year 1965.

a. Incentives, both Performance and Cost have been negotiated for the WTR Contract AF 04(695)-689. The Performance incentive features provide for measurement of the Agena Vehicle performance as relates to the specific program for which it is launched.

b. During the period, definitization of Letter Contract AF 04(695)-501 for Launch Services at WTR from 1 January 1964 to 31 December 1964 was accomplished. This contract included for the first time both Performance and Cost incentives. As of the end of December 1964, the Contractor had underrun the target cost by approximately $1.6 million, and it appears that he met par on performance; however, all flight evaluations have not been completed. Contract AF 04(695)-499 which covered launch services at ETR for the period 1 January 1964 to 31 December 1964 and also had incentive features for performance and cost is expected to have a final underrun of approximately $650,000, and indication is that par performance will be exceeded.

4. During the period, proposals were requested for the follow-on support engineering effort and the follow-on production efforts. Contract AF 04(695)-695 was negotiated on a fixed price basis for a two year period, commencing 1 January 1965 for 2350 man-months of support engineering. The contract provides for and purchased services and materials subcontracting on a cost reimburseable basis. RFP-270 for the production effort will be quoted in January by LMSC.

5. During the period, Agena Production Contract AF 04(695)-451 was definitized.

6. During the period, a significant difference of positions between the Air Force and LMSC was encountered with respect to fee settlement for the definitization of CCN No. 33 superseded by CCN No. 151 to Contract AF 04(695)-194. The interpretation by both parties of application of weighted guidelines caused the situation which necessitated an undue amount of higher management consideration and/or participation in negotiations which were conducted on and off for a period of five (5) months. Final settlement of fee at 8½% was a compromise by both parties exclusive of weighted guidelines considerations.

7. During the period, it was proposed that the major Sub-contractors to LMSC involved in the production of the Agena vehicles be raised to associate status through the issuance of direct contracts to them for subsequent Agena buys. Presentations were made to Generals Funk, Greer, Cooper and Martin. During the course of these briefings, it was recommended that consideration be limited to Bell Aerospace Corporation. Final decision was left to the SSV Deputy. As of 31 December 1964, final decision had not been made and issuance of a Letter Contract to LMSC has been withheld for follow-on production pending final decision. The Agena 1965 buy is the largest to date and is currently out to LMSC on RFP-270.

SSVAE

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VEHICLE ENGINEERING DIVISION
S-01A Space Project Directorate

Historical Report

1 July 1964 - 31 December 1964

The Vehicle Engineering Division consists of two Branches, Astro Vehicle Branch and Electronics Branch. The Astro Vehicle Branch has two sections Spaceframe Subsystem and Propulsion Subsystem. The Electronics Branch consists of Electrical Power Subsystem, Guidance and Control Subsystem and Communications and Control Subsystem.

The following briefly summarizes the major activities for the various sections of the Vehicle Engineering Division for the period 1 July 1964 to 31 December 1964.

HISTORICAL REPORT
1 July 1964 - 31 December 1964
Astro Vehicle Branch
(SSVAE-2)

A. Spaceframe Subsystem (SS/A)

The following items summarize major activities of the Spaceframe Section during the subject time period. Principal section effort was provided for the Gemini Target Vehicle, Titan IIIX proposal, separation joint redesign, S-01A/B Configuration Control, with review and action on design changes and review of Program Plans. In addition, continued support was given to programs using Agena.

1. Gemini-Agena Target Vehicle

This office has provided continuing support to the GATV program in the form of insuring complete flight qualification of primary structural components, reviewing of LMSC thermal environment predictions, and maintaining a file on all pertinent SS/A documents which are to be reviewed prior to and during "FACI" of the vehicle.

During the past year all major structural components were qualified both statically and dynamically, including subjection of all items to a SCTB acoustical environment in conjunction with the PTVA firings. The latter, very realistically, exposed the structures to a random vibration condition comparable to that experienced in flight.

Other work included analyzing the results of inner bulkhead reversal tests. Reversal was induced by an oxidizer tank over-pressure. The aim of this test was to determine the failure mode of the diaphragm in the event of a meteorite puncture on the fuel side and the resulting sudden pressure drop. A delta "P" of approximately 8.5 psi will collapse the diaphragm and instant hypergolic detonation will take place. It therefore is critical that a pressure monitoring device be provided to the astronauts to sense any adverse pressure differential.

A problem yet to be resolved is that of the flight worthiness of the procured A-12, Comsat type, aerodynamic shroud. This item experienced a separation failure during early 1964 which has finally prompted LMSC to consider it to be a non-flight qualified item. As such the contractor has requested additional funding to incorporate engineering changes and to conduct a series of evaluation tests. To date GPO, Houston, has been critical of these modifications and has requested Hq SSD to perform a thorough analysis of the problem. This office, together with Aerospace assistance, is presently involved with this study.

Acceptance was also completed on the second of two standard Agena vehicles to be provided to the GATV program.

2. Separation Joint Redesign

The program on separation joint redesign was continued during this period. The main effort was in the form of Control System Stability studies of the spring-band joint effects on Atlas and Thor by General Dynamics/Astronautics and Douglas Aircraft. These studies were required because the spring-band joint added non-linear effects to the booster/Agena system. In September these studies were stopped and the spring-band joint was dropped from consideration because of too many unknown parameters.

In October 1964, LMSC recommended that the present separation joint not be changed on a crash basis because of a series of successful flights. AFSSD concurred with this recommendation. It was reasoned that shock mounting of certain aft section components and several electrical circuit changes had corrected the "shorts" problem occurring during the separation sequence. However, it was still considered desirable to reduce the severity of the shock and contamination environment.

3. Zip-Cord Separation Joint

As a result of some promising development work completed by the SCTB on a new separation joint, the Agena Directorate has funded LMSC to further develop the device in hopes of eliminating contamination at separation as well as lower the existing pyrotechnically-induced shock. The latter has been the scapegoat for reoccurring electrical short circuits. The joint consists of a core of MDF contained within a polyurethane or plastic-type jacket which will also enclose the detonator block. The device, when detonated, expands and shears the magnesium structure, and at the same time contains the MDF residue.

A Phase I effort of this program has been completed. The results indicate that the existing polyurethane jacket cannot withstand the thermal environment (100 - 350°F) it may ultimately be subjected to. Consequently, prior to initiating any Phase II work which is to include design, analysis and development testing, an interim effort is to be conducted by a team from the SCTB and Palo Alto Research in hopes of finding a suitable encapsulating material. Various plastics and elastomers are being considered. This office is presently reviewing all work performed thus far and evaluating the necessary effort to be undertaken in the future.

4. Shock Testing

LMSC effort under Program Plan 135 was completed during this period. The "barrel tester" was developed under this program and is now satisfactory as a component shock qualification facility. The tester uses the same shock-producing mechanism as the separation joint on the Agena. The shock spectrum produced is very similar to the Agena spectrum and is sufficient to produce an overtest for qualification. Shock levels on the tester can be varied by using various MDF charge sizes and separation joint thicknesses. The levels can also be varied by moving the component a greater distance from the separation joint on the tester.

LMSC is presently drafting changes to LMSC 6117D environmental specification to make use of the "barrel tester".

5. Vibration Analysis

The evaluation of the tank modal tests on an Agena vehicle was completed during this period. The original purpose of the testing was to verify that the LMSC mathematical model of the Agena correctly predicted dynamic flight loads produced by the Thor 20 cps oscillations. However, it was determined the mathematical model was not satisfactory, and in fact predicted loads 26% less than loads calculated from flight data. As a result LMSC recommended that flight-derived dynamic loads be used for further load predictions on the Agena. The Agena loads document has now been revised to reflect flight-derived loads instead of the calculated loads from the math model.

6. Titan IIIX/Agena

It has been proposed to use the Agena with the Titan IIIA booster. Evaluations have been completed on the LMSC preliminary redesigns necessary to mate the Agena to the Titan III. Major changes will be a new booster adapter, aft rack structure and roller changes for increased roller loads and electrical harness changes. Depending on the high altitude wind criteria that will be used, changes to heavier forward section beryllium skins and increased propellant tank pressure may be required. Essential features of the new booster adapter are flaring of the adapter from the 60 in. diameter Agena to the 120 in. Titan, varying from a semi-monocoque design at the Agena separation joint to a longeron structure with unstressed skin at the Titan/Agena mating joint, and large access openings to the Agena aft rack. The longeron-unstressed skin design is necessary to make the load paths in the adapter compatible with the longeron-unstressed skin structure of the Titan.

7. Plumbing Improvement Program

With the continued subjection of Agena tubing and fitting assemblies, etc., to the severe environments of ascent and extended orbital flight, it has been a wide-spread problem to maintain a leak-free condition in a high pressure, rarified gas system. Many components previously qualified under aircraft standards, i.e. "AN", cannot hold up under space vehicle stress. Such problems as torque relaxation, stress corrosion, galling tendencies and the like, have to a varying degree on various items indicated either a poor basic design or inadequate quality control.

This office, therefore, has been working in cooperation with LMSC in an attempt to review the entire spectrum of the problem. As a consequence of this effort the following practices, to name a few, have been or will be instigated:

a. Retooling nitrogen tubes commencing with AD-92.

b. Improve means of recording discrepancies - FEDR's.

c. Installing soft-nose "O" ring plugs for proof pressurization of tubes.

d. Elimination of "AN" parts.

e. Install new flaring equipment.

f. Training of personnel in all areas so that poor quality hardware can be recognized.

g. Better inspection procedures.

With the future intention of qualifying better designed components, a series of preliminary tests will be conducted at LMSC. These tests include evaluation of new, highly calibrated torque wrenches and the use of elevated torque levels. The latter will be placed on a series of existing fitting assemblies in order to establish a failure mode history, the results of which may be compared to MIL-F-5506A and thereafter be available during qualification testing. In addition a follow-on, interim test will be performed on the new attitude control gas assemblies presently on AD-92 and up. This test will consist of two identical units, one at elevated torquing, being subjected to the vibration and shock environments established by 6117D. In the event the latter passes all testing, these higher torque levels will then be available for use provided a leaking condition persists in a high quality installation. However, it is hoped that with use of high quality components no leak problems will occur.

A final qualification effort under consideration will include the qualification of a new Wiggins "DL" nut, design and fabrication of three-dimensional check-out fixtures, design review of installations, and an industry survey primarily of those companies taking part in either Project Gemini or Project Apollo.

8. High-Pressure Helium Sphere

A requirement was established to qualify a new high pressure (3600 psia) helium sphere in light of data obtained on the 8096 engine inlet pressures for the S-01B carrying a heavy payload. Since Air Force approval was granted, LMSC has directed the vendor to fabricate assemble and qualify a 1612 cu. in. pressure vessel. The latter is of the same general configuration and dimensions as the original standard sphere with the following exceptions:

a. The wall thickness will be increased proportionally to maintain the same tensile strength capability at the higher pressure.

b. The new sphere, except the two qualification units, will incorporate a female boss with an "MC" male fitting to facilitate cleaning.

c. A new temperature monitor will also be qualified for use which will include a contoured base and a small plate under the beads to provide better adhesion characteristics.

To date, both qualification units have successfully completed all phases of qualification testing. Moreover, the ultrasonic cleaning process met with approval and the new temperature monitor functioned adequately throughout, including the burst test. In fact the monitors, after having come off due to burst, were still intact and functionally sound.

B. Propulsion Subsystem (SS/B)

1. YLR81-BA-11

This is the present production engine and is being utilized as the primary propulsion unit with the Agena Space Vehicle. Twenty-two engines have been flown during this reporting period with successful engine operation on all flights. Premature shutdown was encountered on one flight due to an erroneous shutdown signal; however analysis indicates a vehicle control circuit malfunction rather than an engine problem. During this reporting period the turbine exhaust duct was redesigned and qualified to a circular cross section from its recent eliptical cross section. This change was made to provide a more uniform configuration and to facilitate duct alignment prior to flight.

2. XLR81-BA-13

This engine is a modification of the YLR81-BA-11 and is being developed to provide multi-restart capability for the Gemini Agena Target Vehicle (GATV).

During this reporting period the majority of the PFRT penalty testing was completed. Some minor oxidizer gas generator valve verification remains to be accomplished but the flight configuration appears finalized.

3. Secondary Propulsion System

a. PFRT - The Model 8250 Secondary Propulsion System (SPS) completed Preliminary Flight Rating Test (PFRT) on 28 August 1964. The only major problem was the burnout of the 200-lb thrust chamber. A test program was conducted on two of these chambers. This program established that the problem was acoustic resonance caused by high temperature propellants. To eliminate the possibility of a burnout, the predicted on-orbit propellant temperatures were reduced and the firing duration above 70°F was also reduced.

b. Launch/Hold Test - A demonstration program was conducted on the first flight module to extend the hold time capability to a total of 40 days. This was successfully completed in early November 1964.

c. Regulator Redesign - Throughout the SPS development program the gas regulator has shown a tendency to increase regulated outlet pressure over a period of several months. To correct this creep problem the regulator was modified very slightly. A test program is currently in progress to verify the redesign.

4. Propulsion Test Vehicle Assembly (PTVA)

The GATV PTVA final two firings were completed during this period. Both the primary propulsion system (the YLR81-BA-13) and the secondary propulsion system (BAC Model 8250) demonstrated compatible and successful operation.

5. Vehicle 5001

The two PTVA SPS modules and the first production YLR81-BA-13 engine are installed on Vehicle 5001 for hot firing at Santa Cruz Test Base. This firing will occur in January 1965. The first two flight SPS modules for Vehicle 5001 were acceptance tested at Bell Aerosystems and are ready for shipping.

6. Propellant Feed, Load, and Pressurization System

During this reporting period system compatibility testing was performed to verify tank pressures required and engine pre-valve (Propellant Isolation Valve (PIV)) sequencing for restart missions. Testing indicated that pressures in the main propellant tanks would have to be raised in order to assure reliable restart. PIV sequencing tests indicate that engine refill will be accomplished successfully with the increased tank pressures. During this period two S-01B restart missions were flown with successful restart achieved (Mariner Mars - 64). Passive ullage orientation was not demonstrated, however, as a small nitrogen thruster (0.1 pound thrust max) was utilized during coast to prevent main tank propellant deorientation.

During PREP Round IV testing, it was discovered that the fill coupling would not go the required 15 days on-pad when exposed to liquid oxidizer. The testing did confirm a 7-day capability. The poppet valve in the coupling will be redesigned to meet the 15-day hold requirement. In addition, a non-interchangeability feature will be incorporated to prevent the possible inadvertent interchange of the fuel and oxidizer service connections.

Final qualification testing and pad-hold demonstrations of the Pyro-Helium Control Valve were completed. The valve has been flown successfully on 4 flights.

7. .9KS500 Retrorockets

The verification-qualification program established to verify the configuration of the rocket motor igniter and to determine acceptance/rejection criteria for the igniter was completed. The igniter was demonstrated acceptable for flight use, and 40 were successfully flown. Criteria were determined by which to accept or reject igniters prior to installation in the motors. These criteria will be used as a basis for acceptance testing future lots of igniters.

8. Sensor Bar Pinpuller

During a 38-day on-pad test, the pin in the sensor bar pinpuller corroded, preventing operation. A material substitution was made on the pin and retaining spring. The pinpuller was then retested to the corrosive portion of the 38-day test. During this test, one of the pins failed to retract the required amount. Investigation showed that the bending process used in making the retaining spring was more critical for the new stainless steel spring than for the original spring. It was concluded that the basic design of the device was marginal and a redesign will be accomplished.

C. Electrical Power Subsystem (SS/C)

1. Ground Test Failures

To reduce the number of ground failures, modifications to both the Type IX and Type X converters are now in process. The new features will enable the units to withstand ground-handling and human problems while improving flight confidence.

2. Piece-Part Problems

There were several problem areas with piece-parts involving capacitors and relays.

a. Tantalum foil capacitors - leaky capacitors caused several problems on the conversion equipment. At high Temperatures, the capacitors were highly stressed such that electrolyte leaked out from the non-hermetic seal case. The problem was solved when true hermetic seal tantalum capacitors became available and are used in the modified converter.

b. Relays

(1) Rusted relays were discovered in the aft safe/arm J-box. A new relay was already in the process of being qualified and in-line changes are to be made on all affected vehicles. Some using programs were directed to retrofit their boxes with the newly qualified relays. The faulty relays were removed from stock.

(2) A second type of relay failure occurred due to teflon particles breaking off from a teflon-coated actuator bead in the relay. This condition caused improper relay contact to be made. Since this relay is used in the aft safe/arm and discrete/destruct J-boxes, immediate action was taken to obtain another relay and replace it in the affected boxes.

3. Battery Failures

After an extended period of satisfactory performance of silver oxide-zinc primary batteries, two occurrences of in-flight battery failures resulted in one instance of flight failure and one of mission curtailment. Extensive testing and investigation in this area has led to increased system thermal control and to minor modifications of battery design. Simultaneously with this effort, vendor quality assurance has received increased surveilance and assistance from the prime contractor.

4. Type XIV Battery

Development of this zinc-liquid oxygen (ZOX) hybrid battery as a future power source is expected to be reinitiated in early 1965. This electro-chemical system should satisfy power requirement in the 40 to 60 kilowatt-hour range for mission duration of up to two weeks with comparable power/weight advantages of fuel cells but with greater simplicity and considerably less cost.

Historical Report

D. Guidance and Control Subsystem (SS/D)

1. Horizon Sensor System

The Mod IIC Horizon Sensor was flight tested in October and, in general, performed better than the Mod IIA. The Mod IIC plus recent retrofit and modifications (relays, transformers, bolometer solder connections, potting compounds, etc.) should provide significant improvement in the performance and reliability of the horizon sensor system. Production effectivity was vehicle AD-70.

2. Inertial Reference Package

An improved Inertial Reference Package was proposed by Minneapolis-Honeywell. The proposed package is electrically and mechanically interchangeable with the present Mod III system and offers improvements in weight, volume, accuracy, performance and reliability. These improvements are made possible by the use of advanced packaging techniques, reduced parts count, further derating of component application and incorporation of MIG gyros in place of the two HIG gyros used in the present system. Action on this proposal is being delayed pending a decision on the Integrated Guidance Module proposal which specifies use of the Mod IV Inertial Reference Package.

3. Velocity Meter Counter

The Mod IIA Velocity Meter Counter which completed qualification testing in April 1964 became standard equipment on Agena D vehicles at vehicle AD-92. The Mod IIA counter should provide improved performance and reliability over that of the previously used Mod II Counter.

4. Sequence Timer

Studies were performed on the Sequence Timer to determine design improvements that would eliminate existing marginal characteristics of the counter assembly and the switch actuating mechanism. The ultimate objective was to improve overall reliability of the timer. The results of these studies were submitted to AFSSD as a redesign proposal in December. From a technical point of view, the proposed redesign is desirable and is currently under consideration.

5. Flight Control Electronics Assembly

A small transformer, which is used in twenty-five different applications within the Flight Control Electronics Assembly, developed a failure mode associated with temperature cycling during early 1964.

Testing of an improved transformer to correct this deficiency is nearing completion; and, thus far, the new transformer exhibits no deficiencies. Incorporation in early 1965 is planned.

6. Guidance Junction Box

Failure investigations in December verified the existence of contamination in Hi-rel Relay (LS 8453) which is used in twenty-three different applications within the Guidance Junction Box. Contamination is due to deterioration of the teflon coating on the glass bead that moves the arm of the relay contacts. Corrective action is currently under investigation.

7. Pneumatic Regulator

The Sterer pneumatic regulator which has been under development and test for the past two years was approved for flight and installed on vehicles AD-82, 83, 84 and 85. This equipment has undergone more extensive testing than the Whitaker regulator, which is standard equipment, and has proven superior in most respects; i.e., smoothness of regulation, flow and temperature limits. In the future, both Sterer and Whitaker units will be purchased on a competitive basis and used interchangeably.

8. Control Moment Gyro, Mod II

The Mod II Control Moment Gyro experienced many difficulties during late 1964 including the failure of the qualification unit. These problems, which were all related to quality control, have been corrected; and manufacturing procedures have been changed to preclude any similar failures in the future. The new qualification unit is undergoing acceptance testing and will start formal qualification testing in February 1965. Current production rate is one unit per month.

9. Integrated Guidance Module

In late 1964, the Integrated Guidance Module (IGM) was again recommended by LMSC as an improved guidance and control system for the Agena D vehicle. This submission was relatively unchanged from previous submissions. It proposed consolidation of all guidance and control components (excluding actuators and thrusters) into a single module and addition of a low thrust attitude control system. The major benefits obtainable are improved performance and reliability and decreased weight and size. The recommendation is under consideration.

10. Design Review and Failure Mode Analysis

Phase I of a two phase Design Review (DR) and Failure Mode Analysis (FMA) on the Guidance and Control Subsystem was completed in late 1964. This effort involved an evaluation of the existing

DR and FMA documentation on each component of the subsystem in order to establish deficient areas upon which to base the Phase II follow-on effort. Phase II will commence in early 1965.

11. Guidance and Control Engineering Analysis Report

An Engineering Analysis Report (EAR) on the Guidance and Control Subsystem was published in late 1964. It contains equipment descriptions, illustrations, schematics, and analysis showing system functions along with their limitations and inaccuracies. It was prepared for the specific purpose of describing the Guidance and Control Subsystem to persons knowledgeable in the guidance and control field but unfamiliar with the particulars of the Agena system.

12. Guidance and Control Equipment Display

The guidance and control equipment of the Agena D with the exception of the classified components are now on display in the AFSSD Agena Vehicle Engineering Office. The equipment is mounted to facilitate easy disassembly and, hence, provides a significant aid to engineering personnel.

13. MIT Stability Studies (Gemini)

Subsystem D personnel prepared and managed two contracts with the MIT Instrumentation Laboratory concerning stability aspects of the Gemini Agena Target Vehicle.

a. The first contract May-Sep 64 was concerned with the overall stability of the Spacecraft-Agena in the docked configuration with the Agena main engine thrusting. With the two vehicles joined by a relatively weak and flexible docking adapter, there appeared to be an unstable bending mode. Both MIT and LMSC have studied the problem and have developed tentative solutions. A final decision as to which fix, if any, is needed will be made when the docking adapter parameters (stiffness and damping) are better known. Structual tests to develop this information are scheduled for January 1965 at Mc Donnell Aircraft Company.

b. In August 1964, MSC (NASA) requested AFSSD to look into the feasibility of connecting the Agena Control System to the hand controller so that the astronaut could "hand-fly" the docked combination. This method of flight was desirable if it could reasonably simulate booster control modes where the astronaut acts as a back up controller of the booster. (Apollo is such a vehicle). Simulation was accomplished by modifying the then existing analog simulator at MIT. The results showed that the astronaut could control the docked combination; however, the possible Agena control modes could not closely simulate any of the Apollo modes. This additional capability will not be designed into the Gemini Target Vehicle.

E. Communications & Command Subsystem (SS/H)

1. Command Destruct Receiver - A series of design changes have been proposed for incorporation into the presently qualified Command Destruct Receiver. These changes have been examined, and sixteen have been approved. They include transistor changes (improved performance), filter changes and relocation, and other piece part substitutions designed to greatly improve performance and reliability. Inclusion of the changes will necessitate some qualification and Electromagnetic Interference testing. The actual changes and testing will be accomplished in early 1965.

2. Telemetry System - Great improvement has occurred in three assemblies of the Type V Telemetering System.

a. Mod Amp and Time Delay: Redesign, fabrication, and qualification of new A. C. Modulation Amplifiers and Universal Time Delay units has taken place. These units were redesigned incorporating specially selected "Hi-Rel" parts. A selection of units of each type underwent reliability stress testing and 127 days of accelerated (one hundred per cent duty cycle) life testing. All units of each type completed electrical functional tests at conclusion of life testing, and performance was entirely satisfactory. The new Mod Amp and Time Delay are currently scheduled for incorporation into the Type V Telemeters being fabricated.

b. Commutators: Over a period of more than a year, failure of the commutators has been a top priority problem. The main difficulties have been (1) failure to start (2) erratic speed of operation. Since the commutators are electro-mechanical in nature and employ a small D.C. motor, the primary attention was directed toward improved or different motors. The problem has now been solved satisfactorily, with the completion of qualification of two commutators (Produced by Lind Instruments, Inc.). Three additional commutators (produced by Fifth Dimension, Inc.) are ready for qual testing, with this effort expected to be complete in early calendar year 1965. One solution of the commutator problem was the use of a Japan Micro Motor, with a special rotating disc (precious metal) brush. Tests of this ingenious motor have produced excellent results, with performance much superior to conventional D.C. motors. An alternate solution also available is a modified 4-brush type (Globe, Inc.) model 61A109 motor. The modification consists in replacing the standard version brush assembly by a split brush arrangement (4-brush type). A further additional commutator arrangement is a double-motor (2-Globe unmodified motors) type.

3. PAM Telemeter System -- The engineering evaluation testing, manufacturing fabrication effort, and vehicle compatibility testing of the Pulse Amplitude Modulation (PAM) Telemeter, Type VIII, were completed satisfactorily. Although a variety of input impedance, case ground, and data level problems were discovered, all were satisfactorily resolved, and the three PAM VIII units delivered.

4. Three-Way Coaxial RF Switch -- The development program for the three way coaxial switch has continued throughout the reporting period. The purpose of this switch is to provide umbilical-ascent antenna-orbit antenna switching for the telemeter and the tracking beacons. The new switch will provide 90 db attenuation of unwanted radiation of signals and will eliminate one of the two switches used in the present system. All electrical requirements have now been achieved. The most serious problem encountered in the program was in meeting the random vibration test requirements of LMSC Environmental Specification 6117D. A schedule slippage of approximately three months was encountered in solving this problem. By the end of the reporting period, approximately 75% of the qualification tests were successfully completed. Fully qualified status should be achieved by mid-February 1965.

5. Electro-Magnetic Interference Test Program -- An extensive electromagnetic interference (EMI) test program was completed during this reporting period. This program involved the testing of almost all pieces of electronic equipment used on the Agena Vehicle. The tests measure the amount of electrical noise that can be generated by a particular piece of equipment. The determination of effect of this generated noise on other items of equipment was also studied. The susceptibility of each unit of equipment to external generated noise was also determined by testing. All test data was thoroughly evaluated by a joint board of Lockheed/Air Force engineers. The EMI program has resulted in a collection of data that should be especially useful and significant for reducing undesirable EMI in future designs of electronic equipment. The reduction of such interference will greatly increase the reliability of the Agena.

6. Gemini C & C Equipment -- During the current reporting period, the magnitude of the difficulties with the Lockheed (LMSC) designed and fabricated items of Gemini C & C equipment has begun to be apparent. Unless proper corrective measures are instigated and great improvements accomplished, the probability of failures of the C & C Gemini equipment is so high that success or failure of the Gemini/GATV mission is in question.

a. PCM Telemeter System: During last reporting period, the PCM Telemetering System was rejected as unqualified. Subsequently, requal testing started in November 1964 and has been completed with only minor difficulties (apparently). Final Report has not been submitted yet, for Air Force engineering evaluation.

b. Tape Recorder, Type IX: Although the Tape Recorder, Type IX, is generally felt to be a good item of C & C equipment, Qualification testing was completed on 29 January 1964, but no final Qual report has been submitted for review as of the end of this reporting period.

c. Command Controller, Type IV: The original qualification results on the Command Controller were rejected by LMSC Quality Control personnel. The unit was subsequently required to undergo additional high temperature testing. No qualification report has been submitted to USAF engineers on this equipment, but it already has a fairly extensive failure report history. A serious problem with triggering of the Emergency Reset Timer (ERT) was discovered and several fixes attempted. A low pass filter type circuit was installed, and has since been modified to help alleviate the problem. Integrated circuit "bugs" are used extensively in three modules of the Controller. LMSC has now been directed by the Air Force and funded to revise their method of installation of these devices into modules. The reliability of these affected modules should be appreciably improved, when the new fabrication technique is incorporated.

d. Command Programmer, Type XVI: The Command Programmer, Type XVI, represents the single most critical item of Gemini C & C equipment. It is impossible to have a successful Target Vehicle - Gemini Spacecraft mission with the programmer malfunctioning. Every Programmer XVI thus far built by LMSC has had many failures at the piece part module, tray assembly, and top assembly levels. Some critical modules have had in excess of 30 individual functional failures. The majority of these failures have never been completely analyzed, so that complete and adequate corrective action has not taken place. With every functional acceptance test of complete programmers, trays, and modules, a new group of failures occurs. When items do eventually pass an acceptance level test, it is generally after an extensive failure, rework, retest cyclic history. The Air Force engineers on this equipment have continually brought these problem areas to the attention of the LMSC Gemini program office and the cognizant engineers. Improvements are starting to appear, but an overall unsatisfactory situation still exists.

e. Fly-By #1 C & C Equipment: A group of C & C items known as Fly-By #1 was conditionally accepted on 17 Nov 64 on a DD 250, with exceptions clause attached. The "exceptions clause" provides that all discrepancies in drawings, specifications, test procedures, etc. must be corrected to the satisfaction of AFPRO and AFSSD within 90 days or the DD 250 is cancelled.

f. Fly-By #2 Programmer: The Fly-By #2 Command Programmer, Type XVI, Memory Assembly was severely damaged by LMSC negligence in late June 1964. The failure and rework history on this unit is documented on LMSC FEDR 230833, which extends more than 35 pages. The original trouble began when miswiring placed 40 volts onto the 5.7 volt buss, with subsequent module (19 modules) and component failures, plus severe over-stressing of other modules and circuit components. This unsatisfactory situation is still not resolved after more than six months of rework and retest operations.

g. Welding-Soldering Consultants: In July 1964 LMSC was directed by AFSSD to employ two welding-packaging-soldering consultants from Electro-Optical Systems. This resulted from numerous design and fabrication difficulties observed in the Lockheed electronics fabrication and assembly area. The consultants made a short review of the LMSC facilities and electronic manufacturing techniques, then prepared a report outlining many of these deficiencies. The majority of these deficiencies have not been resolved or corrected as of the end of the reporting period.

h. Stanford Research Institute (SRI) Review: Because of the continuing problems in the Programmer XVI Memory area, the LMSC Gemini program office was directed to employ Stanford Research Institute (SRI) to make a comprehensive design review. Their efforts, beginning late November 1964, will continue into 1965, and will be detailed in subsequent reports. Certain "soft" areas of module design have been explored, and the SRI effort is expected to be beneficial in establishing proper circuit designs.

i. Component Piece Part Difficulties: Extremely large failure histories have accumulated against many "hi rel" and specially procured piece parts (i.e. transistors, diodes, resistors, capacitors, relays, transformers, etc.). This problem is compounded since many of the failures occurred in modules, and the cause of failure of the piece part was not determined. What per centage of this component is attributable to "bad" piece parts is therefore questionable. Because LMSC did not carry out full and complete corrective action per MIL-Q-9858A, as required, much valuable information has been lost.

This has, in turn, prevented proper corrective action when modules have failed. Since there have been in excess of 300 failures of all types in the Programmer alone, reliability in equipment is seriously lacking. A particular transistor, the 2N2102 (LMSC P/N 1463087-2), has had over sixty functional failures in modules in the programmer. Most of these failures are entirely unresolved as to cause of the failure. Other piece parts also have critically bad histories.

SSVAG

AEROSPACE GROUND EQUIPMENT DIVISION
HISTORICAL DATA

1 Jul 1964 - 31 Dec 1964

1. Major Robert A. Wells, 49325A, and Lt Stanley F. Martin, Jr., A03121326, were assigned to the AGE Development Branch.

2. Agreement was reached with LMSC on a drawing standard, using MIL-STD-7 as a guide, for test and checkout equipment identified in vehicle test procedures that is not in the AGE Inventory. This equipment is commonly called Test Aids or Auxiliary Test Equipment. The Contractor is to provide a complete inventory of these items early in CY 1965.

3. Negotiations for Launch Capability Contract (LCC) AF 04(695)-501 were completed on 15 Jul 1964. The contract period was for CY 1964. The negotiated price was $26,173,025 compared to $32,825,000, the original LMSC proposed price. The contract included cost and performance incentives.

4. General Funk and General Greer were briefed on the contract and the performance incentive package during the week of 21 Jul 1964. Col Newton and Col Worthington of the 6595 ATW were briefed at VAFB on 27 Jul 1964.

5. The first launch under the performance incentive criteria was launched on 5 Aug 1964. During the period 1 Jul to 31 Dec 1964, 19 vehicles were launched under LCC -501 with 16 of these vehicles covered by the performance incentive criteria.

6. Negotiations for the Follow-On Launch Capability Contract, AF 04(695) -689 were completed 16 Dec 1964. The period of the contract is from 1 Jan 1965 through 31 Mar 1966. The negotiated price was $30,768,488 compared to $31,622,454, the original LMSC proposal price. This contract also includes cost and performance incentives.

7. The conversion of Eastern Test Range (ETR) Complex 14 to a basic Agena D configuration was completed under LMSC Contract AF 04(695)-287. Vehicle on Stand (VOS) capability was attained on 31 Dec 1964. CCN-13, extension of mast cabling, was negotiated for $3,005, cost and fee. Total contract value is $4,658,311. Outstanding is a termination action which deleted installation of Launch Complex 14 of the Secondary Propulsion System (SPS) Equipment being used at Santa Cruz Test Base. This SPS Equipment installation will be done under another contract. Authority for this conversion is SSVZE letter, Conversion of AMR Complex 14 to an Atlas/Agena Configuration, 5 Jul 1962.

8. All equipment and drawings for the Disaster Pool, purchased under LMSC Contract AF 04(695)-317, have been delivered to SMAMA, Sacramento. Total contract value is $970,000 including fixed fee. Authority for the procurement of Disaster Pool Aerospace Ground Equipment is SSVZO letter, Agena Items for Disaster Pool Backup, 6 Jun 1962.

9. A letter contract, AF 04(695)-715, for Agena AGE Environmental Improvements was awarded LMSC on 1 Dec 1964. This effort will provide an improved environmental climate for the Agena vehicle during transportation and launch base checkout periods. The LMSC cost proposal work is $681,000.

10. The Launch Capability Contract, AF 04(695)-499, was issued to the Contractor on 8 Sep 1964. The negotiated price of the contract was $5,413,000 as opposed to the Contractor proposal price of $6,111,925. Performance incentives negotiated on the Launch Capability Contract were operative during the reporting period and there were five flights under the performance incentive. The Contractor's performance under the ascent and countdown incentives was average, and he earned approximately target fee as a result.

11. Negotiations were begun on the Follow-On Launch Capability Contract, AF 04(695)-688, on 8 Dec 64, but because it was obvious that the difference between the Contractor's proposal and the Air Force evaluation of the effort, required during the contract period, was too great to permit definitization by 1 Jan 65, negotiations were interrupted to permit further discussions between the Air Force and the Contractor and issuance of letter contract AF 04(695)-737. After much discussion, new understanding of the work effort resulted in changes to work statement. The Contractor was asked to furnish a revised proposal which incorporated the revisions to the work statement. Negotiations were scheduled to resume during January.

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HISTORICAL REPORT FOR THE AGENA CONFIGURATION MANAGEMENT DIVISION

1 July 1964 through 31 December 1964

1. ORGANIZATION: The Configuration Management Division is established by the Program Director, Agena Directorate. Management responsibilities for the Configuration Management Division are as prescribed in SOP 1. (See attachment #1).

2. PERSONNEL: The manning of the Configuration Management Division, for the period of this report, was changed one time. The Division Chief was transferred to Headquarters AFSC. The replacement for the chief was selected from within the Division. This action decreased the manning of the Configuration Management Division by one officer.

3. MAJOR POLICY AND PLANNING DEVELOPMENTS:

a. There were three major policy developments during the period of this report.

(1) The Uniform Specification Program for the Gemini Agena Target Vehicle System was established. One of the major aspects of this program, policy wise, was the decision to place Aerospace Ground Equipment (AGE) under configuration management. This was the first time the Agena Directorate placed AGE under configuration management. See attachment #2 for implementing instructions governing AGE configuration management.

(2) The Uniform Specification Program for a new program (name not given for security reasons) was started. The major policy aspect of this program was the application of the new Air Force Systems Command Manual 375-1. This is the first time the new manual was placed on a contract being managed by the Agena Directorate.

(3) The Engineering Change Proposal (ECP) Program for the Gemini Agena Target Vehicle System was established. The major policy aspect of this program was the decision for ECP's to be submitted through the local government representative. Attachment #3a and 3b constitute the ECP processing policy documents. See attachment #5 for AFPRO ECP checklist.

b. The major planning developments during the period of this report were as follows:

(1) The entire configuration management effort, after the First Article Configuration Inspection (FACI), on the Gemini Agena program was planned and correlated to current and past developments on the Gemini Agena configuration management phasing chart.

(2) The Configuration Management Division started initial planning on the total configuration management effort for the new program mentioned previously in this report.

4. MISCELLANEOUS ACTIVITIES:

a. In September 1964 the Configuration Management Division created SOP 4. (See attachment #4). This SOP improved the overall effectiveness of the Configuration Management Division by streamlining and standardizing (wherever possible) the total Agena Directorate configuration management effort.

b. The Configuration Management Division wrote, and is presently coordinating, an interface working group proposal. If approved by the Deputy for Launch Vehicles, the proposal will be presented as a policy document in the next Historical Report.

c. The Configuration Management Division wrote the Gemini Agena-AFPRO Memorandum of Agreement. Attachment #5 is the rough draft copy presented to the AFPRO, LMSC, Sunnyvale, California for coordination and comment. This will also be a policy document in the next Historical Report.

d. The Agena Configuration Management Division, aided in the planning and provided the recorder for another program FACI. Attachment #6 is FACI team orders.

e. On 22 December 1964, the Gemini Agena Configuration Control Board (CCB) was established. (See attachment #7).

f. On 4 November 1964, the Gemini Agena FACI team was established. (See attachment #8).

g. On 20 October 1964, the Gemini Agena Specification Control Group was established. (See attachment #9).

h. The Configuration Management Division, revised the Standard Agena Configuration Control Board orders to reflect a change in command. The current CCB Chairman, is the new Agena Program Director. (See attachment #10).

i. The Deputy for Range Safety Engineering, Pacific Missile Range, requested the Agena Configuration Management Division to brief one of his staff members on configuration management and discuss planning aspects of applying configuration management to the Range Safety System. This was accomplished in September 1964.

j. An improvement to the LMSC configuration management effort was establishment of the Air Force-LMSC, Configuration Management Pipeline meeting. These meetings, conducted on a regular basis proved to be a valuable aid in increasing understanding and resolving configuration management problems.

5. This completes the narrative portion of the report, attachments follow.

Basil W. DeOlivo Maj USAF

for LAWRENCE S. NOLAN
Major, USAF
Chief, Configuration Management Div
Agena Directorate

~~10 Attachments:~~
1. CMO SOP #1
2. Implementing Instructions Governing AGE
3. a. CMO SOP #2
   b. CMO ECP Flow Chart
4. CMO SOP #4
5. AFPRO Checklist
6. FACI Orders
7. CCB Orders
8. FACI Orders
9. Specification Control Group Order
10. ~~Configuration Control Board~~ Order